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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. MARCH 30, 1899. CHICAGO, ILL. NUMBER 13

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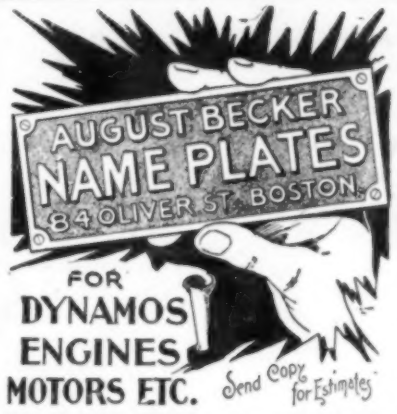

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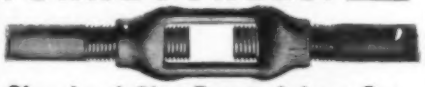
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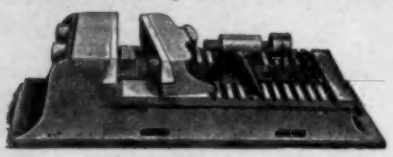

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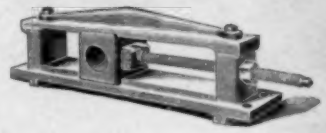

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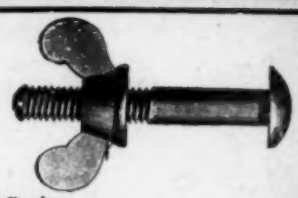

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. MARCH 30, 1899. CHICAGO, ILL. NUMBER 13

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The purchase of 145,000 tons of Bessemer iron from valley furnaces at $14.50 valley, the past week, has helped in some measure to answer the general questioning concerning the basis for the second half of the year. Of the amount stated, 130,000 tons, taken by leading steel-making interests, was for July-December delivery. Furnacemen have no quotation to-day, and the next transactions are expected to be at a higher price, depending on the course of the market for billets and finished material in the meantime. Thus far the steel market has not developed definitely for the last half, and the unsettled question oth in intermediate and finished products relates to the possible check upon consumption that may come from the present high prices. Mills see no reason to step down from the point to which demand has driven values, and establish a new plane for farther future deliveries, and consumers are not prepared to make prices resulting from recent conditions the basis of their costs through a period of months. In a number of finished products the pendency of consolidation projects restricts selling beyond the early future, this being the case in sheets, wrought pipe and bar iron. The situation in respect to steel billets and sheet bars in the Central West is not clear as to business for the second half of the year. Buyers are not entertaining quotations made on to-day's market, but contracts are expected to be negotiated in the near future. Steel billets have sold at $25 in the Central West in the past week, but obviously such an interval between pig iron and steel will not be maintained when large contracts come to be made. Indications are that the selling policy of the leading producer of billets and sheet bars will be in line with that followed by the constituent companies—to make and to sell all the steel its capacity will permit. The foundry pig iron market has shown steady buying the past week in some markets, while in others there has been a disposition on the part of foundrymen to wait for more light, and to gauge the effect of the new furnace capacity about to be added to the producing column. The facts gathered by the American Iron and Steel Association on this point are presented elsewhere. Account is to be taken, in the same connection, of furnaces that must go out for relining, this list including several of good capacity. The persistence of the present rate of consumption is the pivot on which the situation turns. Mills have very little reserve capacity in the next three months schedule, to take care of business expected to develop with the season of outdoor operations, and it is easy to see how the present congestion may be prolonged to the end of the third quarter. Meantime ore supply must suffer no interruption, and there must be no curtailment of production in any line from unforeseen causes. Labor cost will be higher for many mills after the middle of the year; coke is scheduled to advance; and in the valleys there is already agitation for a second advance of 10 per cent in the wages of furnace workers. The elements of increased cost are multiplying in all directions under the prosperity regime. In all the calculations for the remainder of the year there is still the uncertain element of the crops, and definite knowledge will be some time delayed. The rapid advance in pig iron prices has had its expected effect on the export movement, in view of the small advance in iron abroad. Some purchases have been made in the Glasgow market recently to apply against sales of American iron made by a well-known pig iron selling firm. Sales of American iron for Europe are impossible now except at a concession of $1 to $2 below the home price. Scarcity of ocean room and high rates to English ports have been an added reason for buying in Great Britain; but exports continue to Continental markets. Sales of Southern iron in the past week for home consumption have been at $12 Birmingham for No. 2, and $15.25 Chicago. In the Central West the price is still $14.50 valley for No. 2.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World*,
705 PUBLICATION BUILDING, March 29.

The feeling is growing that the highest point in the market is being approached, and there are some who express confidence that the average for the latter half of the year will be lower than the present. Little support for this belief can be found in present conditions. There have been a number of advances during the week under review, but they are mainly of little significance as indicating the general trend, being merely advances in finished material which no more than establish the proper relation with raw material, which had been distorted by the rapid advances in the latter. The large sales of Bessemer pig iron, consummated last week, have established pretty thoroughly the price of $14.50 for Bessemer pig, and in more finished lines values are being established on this basis. While the present range of prices is likely to be well maintained through the summer, conditions may change sufficiently toward the close of the year to admit of somewhat lower prices; but of this there can be no certainty, and it is strongly held that steel products are a safe purchase at present prices well through the summer. The former price on rails, $22 for 100-ton lots and upwards, was withdrawn recently, in view of the fact that billets had reached a much higher figure and negotiations have been on to establish a new basis. Meanwhile temporary figures are quoted, and the figure of $25 has been made in the local market, for both light and heavy sections, but it is not certain that the final price of the Central Western combination will be at that figure. There is increased demand for such lines of finished material as structural iron, which is affected by the approach of seasonable weather for outside operations, and in every direction there are signs of a very heavy use of iron and steel this summer, although it is reported, and doubtless correctly, that some projected operations are being delayed by the high prices.

PIG IRON.—The leading event has been the sale of something like 130,000 tons of Bessemer pig for delivery in the second half of the year, by the valley furnacemen. Of this tonnage, 90,000 tons was taken by the National Steel Co., for deliveries extending over the second half of the year. Some of the plants acquired by this company are self-supporting in the matter of pig iron. The Ohio Steel plant will not receive metal from its two large blast furnaces which are under construction until late in the year. This plant will use from 35,000 to 45,000 tons a month, so that the purchase of 15,000 tons a month will be wholly insufficient in itself, but the works already have a partial supply from related furnaces. Of the balance of the 130,000 tons sold, 20,000 tons went to the Carnegie Steel Co., and 10,000 tons to other parties, all for delivery during the third quarter. It is understood the Carnegie Steel Co. is making about enough iron to keep it going, but has bought this quantity to be on the safe side. The furnaces could probably find a few thousand tons for delivery up to July 1, for which the price would be $14.50, and there may be a few lots of storage and other outside iron to be closed up

before that date. In the past week sales of 15,000 tons of wrought iron have been made. In foundry iron there has been some uncertainty, growing out of a feeling which has spread among foundrymen that the present prices will not be maintained. The representative of a furnace shortly to be blown in has been offering its product, for delivery in June and thereafter, at prices much below those current, and the result seems to have been more to make buyers suspicious than to effect sales. No. 2 foundry is generally quoted at $15.50 to $15.75, and it is understood that some small lots have changed hands at figures much higher than this, which sales, however, do not establish the market. In gray forge there is none to be had in the valleys and the market there is scarcely quotable, while in the Pittsburg district sales of moderate quantities have been effected at from $14 50 to $15. There is question as to whether the prices for gray forge will show the same permanence as the Bessemer price shows every sign of doing. We quote as follows, it being understood that the Bessemer price is good for the second half of the year:

Bessemer, valley furnace	$14.50
Bessemer, Pittsburg	15 15 to 15.50
No. 1 Foundry	15.75 to 16.00
No. 2 Foundry	15.50 to 15.75
No. 3 Foundry	15.00 to 15.50
Gray Forge, valley furnace	14.00 to 15.00
Gray Forge, Pittsburg	14 50 to 15 00

STEEL.—The steel mills are unwilling to sell beyond July 1, and between now and then can furnish very little steel, an occasional lot of a few hundred tons being accepted, while it is understood some quotations have been made for the third quarter on the basis of present prices, on which buyers have not taken hold. There is some steel in middlemen's hands, and there is temptation on the part of some who have bought steel to sell at the higher range of present prices, such a transaction showing as much profit as it would to work it into finished material. We quote the market at $25.50 to $26, noting that it is claimed in some exceptional cases higher prices have been offered for abso ute spot de ivery. All the mills are more or less behind in their deliveries, in many cases as much as 30 days, due mainly to the hindrances to production in the past three months, and the present car shortage, which is growing to be a serious matter. The National Steel Co. has as yet sold little material, and seems to be well filled with orders for all that can be turned out. In wire rods and sheet bars there is no market, and has not been for some time.

FERRO-MANGANESE.—Very little foreign ferro is coming in, and it is claimed producers have an arrangement with foreign ferro combination by which the material is kept out. At the same time it is plain that the present prices are more than warranted by the conditions in pig iron. Prices have advanced lately, and $70 is now quoted for domestic 80 per cent.

STRUCTURAL MATERIAL.—The demand for structural material continues to increase and a very busy season is among the certainties. Prices have not been changed and are as follows: Beams and channels, 3 to 15 inches, 1.40c; 18 to 24 inches, 1.50c; tees, 1.45c; zees, 1.40c; and angles, 1.40c to 1.45c; universal mill plates, 2c.

RAILS AND TRACK MATERIAL.—The rail makers s mewhat tardily entered upon a discussion of advancing prices from the $22 basis, which had become considerably below the price of 4 x 4 billets, and during the negotiations some advances were made by individual mills. The price in this district is now quoted at $25, irrespective of the tonnage. In track materia! there has been a general advance made of $2 a ton, the market conditions being strong, and fully warranting a position commensurate with that maintained in steel, and we now quote: Spikes, 1.70c; track bolts, 1.90c to 1.95c; splice bars, 1.50c; links and pins, 1.70c to 1.80c.

BARS.—The market for both steel and iron bars is very strong, and quotations, while somewhat irregular, are decidedly higher. We quote steel bars at 1.50c to 1.60c, and iron bars at 1.45c to 1.50c.

PLATES.—There is very little plate capacity available and it would be difficult to place an order for any considerable tonnage this side of July 1, while for the latter half of the year producers are not quoting freely, preferring to wait. As high as 2.25c has been named on tank plate, but the range of prices formerly quoted is nearer the market, and we quote nominally as follows: Tank plate, 2c; shell, 2.05c; flange, 2.10c; fire box, 2½c to 3½c.

IRON AND STEEL SKELP.—There is very little skelp to be had and quotations are decidedly irregular. The uncertainty in raw materials leads mills to quote very fair prices for later delivery, while for quick shipment there are very few producers in the market. We quote steel skelp, largely nominal, at 1.55c to 1.60c for grooved and 1.80c to 1.90c for sheared, and iron skelp at 1.60c to 1.70c for grooved and 1.85c to 1.90c for sheared.

SHEETS.—As reported last week, there is practically no market on sheets. There are conflicting reports as to the progress of the efforts to consolidate the sheet mills, but it is understood that steady progress is being made, and that the deal will be accomplished within the near future. The mills are well filled with orders as far as their supplies of steel, which are uncertain, will justify them, and are practically out of the market. Some heavy gauges have been sold at high prices. We quote the market nominal at 2.50c for No. 28 common, one pass through cold rolls. In galvanized sheets the market is somewhat easier, and as low as 75 per cent off, with a 15-cent freight allowance, can still be done on desirable orders; yet there are considerably higher quotations made.

PIPES AND TUBES.—The consolidation movement is making steady headway, and about all the options are in, the question now being the harmonizing of these and providing the necessary funds. It is understood that the great bulk of the stock will be subscribed by the constituent concerns, so that the latter matter is of minor importance. There has been no change in the schedule of prices. Mills are well filled with orders and there is a heavy demand, in some cases it being necessary to turn down buyers. We quote: Merchant pipe, base discount 60 per cent and additional discounts five 10's for less than carloads and five 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 52½ and 10 for screw and socket joint and 52½ for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½-inch, 45 per cent; 1¾ to 2½-inch 55 for iron and 60 for steel; 2¾ to 6-inch, 60 for iron and 62½ for steel, all with an extra 5 per cent to dealers.

SPELTER.—The spelter market has varied little from last report, and we quote as follows: St. Louis, 6.15c; Pittsburg 6.25c to 6.30c; New York, 6.35c to 6.40c. It is generally admitted that spelter is not likely to touch 6 cents again for some time to come.

OLD MATERIAL.—There is only a moderate business doing in this line. Old car wheels are especially scarce. In heavy melting stock we quote billet crop ends at $14.50 and rail crop ends at $14.75 up, according to conditions. Other lines we quote as follows: Old steel rails, long lengths, $12.50 to $13; cut, $13 to $13.50; old iron rails, $17 to $18; wrought iron scrap, $15 to $16, valley; cast borings, $8, net, Pittsburg; busheling scrap, $11 to $11.50, net; car wheels (nominal), $14 to $14.50, gross; cast scrap, $12, gross; charcoal scrap, $13, gross; wrought turnings, $8 to $8 50, net, Pittsburg.

COKE.—There is a heavy demand for coke, and new ovens are being constantly fired up. The last reports showed 16,129 ovens active and 2,514 idle in the Connellsville region. Some coke is being sold for the second half of the year. Prices are $1.75 for Connellsville furnace coke, and $2.30 for foundry and crushed.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, March 28.

There has been somewhat less activity the past week than in the two or three preceding both in pig iron and finished material lines, and no change of significance in prices or in general conditions is to be noted. Bridge work is still a considerable factor, and the tonnage of structural steel placed through the local office of the Pittsburg producer has been quite heavy for several weeks. The bar mills are still awaiting definite word concerning the negotiations for a combine; the task is a large one and even with success reasonably assured matters have arisen that will cause delay, at least.

PIG IRON.—The week has not brought out any large transactions, but there is the same report of scarcity of iron and on some grades advancing prices. Some buyers take the view that present prices will not be maintained after July 1; but in other cases requirements for the second half are being covered at current prices. Local coke iron has advanced to a range of $15 to $15.50 for No. 2, the former price being

realized on strong iron and the latter on certain soft grades. Southern No. 2 foundry has been sold at $15.25 and in some cases higher figures have been realized. Lake Superior charcoal is higher at $17.50 and furnaces out of the market on deliveries in the next three or four months. The Calumet Furnace is being taken hold of by a newly formed company in conjunction with a pig iron firm, and will be blown in after repairs, which will take some weeks. We quote:

Lake Sup. Charcoal	$16 50@$17 50	Southern Coke No. 3	$14 75@15 00
Local Coke Fdy. No. 1	15 50@15 75	Southern No. 1 Soft	15 50@16 00
Local Coke Fdy. No. 2	15 00@15 50	Southern No. 2 Soft	15 00@15 50
Local Coke Fdy. No. 3	14 50@14 75	Southern Silveries	15 50@16 00
Local Scotch Fdy. No. 1	15 50@15 75	Jackson Co. Silveries	17 00@18 00
Local Scotch Fdy. No. 2	15 00@15 50	Ohio Strong Softeners	15 50@16 50
Local Scotch Fdy. No. 3	14 50@14 75	Alabama Car Wheel	17 50@18 00
Southern Coke No. 1	15 50@16 00	Malleable Bessemer	15 50
Southern Coke No. 2	15 00@15 50	Coke Bessemer	15 50

BARS.—No change has taken place in the past week. Demand is somewhat quieter and prices remain as last quoted, the ideas of the mills being strong in view of the expectation that the combination project will be carried through. We quote common iron at 1.45c up, mill shipment, while sales from store are made as high as 1.65c or more. Steel bars are quoted at 1.50c, from mill, and 1.65c to 1.75c from store.

STRUCTURAL MATERIAL.—Sales of about 8,000 tons of bridge material were made through the local office of a leading Pittsburg mill. A 900-ton contract was also let for a local office building. Thus far there is no pronounced indication that the present prices of material have stopped construction work, though specifications now going to the mills are very largely on low priced material. Quotations are as follows: Beams, 15 inch and under, 1.55c to 1.60c; 18 inch and over, 1.65c to 1.70c; angles, 1.55c to 1.65c; sheared plates, 2.10c to 2.20c; universal plates, 2.10c to 2.20c; tees, 1.60c to 1.65c; zees, 1.55c to 1.60c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—The situation does not improve to the extent of any gain upon their orders by the mills. In spite of the large output new bookings are fully as large. Quotations are as follows: Tank plates, 2.10c to 2.20c; flange steel, 2.20c to 2.40c; marine, 2.60c to 2.65c; fire box steel, 2.25c to 4c.

MERCHANT STEEL.—With demand well sustained we quote as at last report: Open-hearth spring, tire and machinery steel, 2.30c to 2.35c; smooth finished machinery steel, 2.35c to 2.45c; smooth finished tire steel, 2.15c to 2.25c; tool steel, 6c to 7.50c; specials, 10c and upwards.

SHEETS.—The market is very firm, with mills unwilling to quote beyond two or three months, since the sheet bar cost is uncertain. Prices are made at 2 50c to 2.60c for No. 27 common black sheets and 2 70c for No. 27, with one cold pass; Galvanized sheets are selling at 75 per cent off.

RAILS AND TRACK SUPPLIES.—Though booked for most of the year, rail mills are doing some business on small orders and have made prices more nearly in line with the billet market. We quote: Standard section rails, $24 to $25; light rails, $24 and upwards; steel splice bars, 1.40c to 1.50c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

SCRAP.—The market is active, with prices in sellers hands. Mills and foundries are taking material freely, but are hampered in some lines by scarcity. Present quotations are about as follows:

Old iron rails, gross	$17 00@$18 00	Axles, net	$17 00@$17 50
Old steel rails, long, gr.	11 25@11 75	Cast borings, net	6 00@6 50
Old steel rails, short	10 50@10 75	Wrought turnings, net	7 25@7 75
Old wheels, gross	15 25@15 75	Axle turnings, net	9 50@10 00
Railroad forge, net	14 50@15 00	Mixed steel, gross	8 00@8 50
Dealer's forge, net	11 50@12 00	Stove plates, net	8 00@8 50
No. 1 mill, net	9 50@10 00	Heavy melting steel, gr.	11 00@11 50
Heavy cast, net	11 50@12 50	Old iron splice b., net.	16 00@16 25
Malleable cast, net	8 50@9 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., March 29.

The chief matter of interest in ore circles is contributed from the transportation end of the business. Negotiations for vessels for steel companies have been under way in the past few weeks, and it is now announced that the American Steel & Wire Co. has practically closed for the five steamers of the Zenith Transit Co.—the Queen City, Empire City, Zenith City, Superior City and Crescent City. All are of the largest class and together could bring down 29,000 tons of ore in a single trip. With good dispatch they could carry 550,000 to 600,000 tons from the head of the lake in six months. Thus far the American Steel & Wire Co.'s own ores consist of the product of the Negaunee mine on the Marquette range and the Sauntry mine on the Mesabi range. Two boats now building for the Zenith Transit Co.'s fleet—the Pennsylvania and the Texas—have been bought for the Federal Steel Co. These are also 6,000-ton vessels. For the Cleveland-Cliffs Iron Co.'s fleet the Centurion has recently been purchased. Rogers, Brown & Co. have bought several of the lighter draught vessels such as have carried their ore to Tonawanda for a number of years. The withdrawal of many vessels of this type from the lakes to the seaboard had made a a scarcity of such tonnage, and modern boats could not reach the Tonawanda docks. Other vessel deals for big ore producers are only a matter of time. Negotiations for mining properties are still talked about; but the Lake Superior Iron Co. proposition still lacks definite development. Speculation is busy as to the plans of the one important consolidation that with 10 blast furnaces has only a part interest in one Mesabi mine. The Carnegie-Oliver interests have added the Dober to their Menominee range properties.

PIG IRON.—The negotiations for Bessemer iron which were referred to last week resulted in immediate sales of 130,000 tons—90,000 tons to the leading billet and sheet bar interest, and 30,000 tons and 10,000 tons respectively to two Pittsburg buyers. All was bought at $14.50 valley furnace and is for delivery in the second half of the year, the bulk of it in July, August, September and October. Three spot sales of 5,000 tons each were made later, all at $14.50. There is now no open quotation on Bessemer iron—no market price, in fact—and each subsequent transaction will be negotiated by itself. The last sales were not made through an agent, but by the furnacemen themselves. As is well known, there is a considerably smaller production of Bessemer iron in the valleys than at the time the association of furnaces was formed, some being on basic, others on foundry and yet others on low phosphorus iron, while one furnace has been sold to a consumer. The iron sold for the second half probably represents upwards of a third of the independent Bessemer production of the associated furnaces for the second six months of the year. The foundry iron market has shown continued activity, though not at the rate of February buying. Both valley and Southern irons have been sold for the second half of the year. The common basis for No. 2 is $14.50 valley furnace. There has been some little variation from this price, on either side. Foundrymen are buying at present prices, as their old contracts run out, and in some cases are covering wants running into next year. There is no leeway on current shipments, but consumers have not yet been put to positive hardship by failure to get iron. No sales of forge iron are reported, but $14.50 to $15 in the valley would no doubt be paid. Charcoal iron is higher and scarcer. We quote f. o b. Cleveland:

Bessemer	$15 15	Valley Scotch No. 1	$15 90@16 15
No. 1 Strong Foundry	15 65@16 15	Valley Scotch No. 2	15 40@15 65
No. 2 Strong Foundry	15 15@15 65	Gray Forge, valley	14 00@14 50
No. 3 Foundry	14 75@15 00	Lake Superior Charcoal	15 00@16 00

FINISHED MATERIAL.—It has been a week of steady demand in some lines, and of quietness in others. The producers of sheets and bar iron, and of wrought pipe, also, are more or less absorbed with consolidation problems, just now, and future business in these lines is in an uncertain state. Buyers are scarcely more disposed than sellers to take up the question of their supply for later months of the year. Some little business in plates is reported for the second half at a price close to 1.90c for tank, but this is exceptional. Sheet mills are well filled up for the next three months. One large producer has withdrawn from the market on common black sheets. A local sheet mill has been put in order to start up, but has been unable thus far to get a supply of sheet bars. We continue the quotation of 2.50c to 2.60c Pittsburg for No. 27. Bar mills are well booked to the middle of the year and agricultural and railroad contracts reach beyond that point. The market is firm at 1.45c to 1 50c valley and Cleveland mill. Steel bars as quoted to local buyers are 1.55c to 1.60c, Pittsburg, and the mills, though making large outputs do not gain much on the accumulation of orders. Structural mills report a large business, but local demand in these lines is only moderate.

OLD MATERIAL.—Local sellers of scrap find difficulty in getting material to take care of their trade, and the condition is a complete reversal of what has existed for the past four years. We quote old iron rails at $18.50 to $19 valley mill; old steel rails, $13 to $14; old car wheels, $16, Cleveland—all gross tons. No 1 railroad wrought scrap, $16 to $16.50, valley; busheling scrap, $12; machinery cast scrap, $12; wrought turnings, $9.50; cast borings, $8; old iron axles, $19—all net tons.

IRON IN ORNAMENTAL WORK.

The 192nd monthly meeting of the Engineers' Society of Western Pennsylvania was held Tuesday evening, March 21, in the lecture room of the society's house, 410 Penn ave., Pittsburg. There was a good attendance.

The committee on the abatement of smoke recently appointed reported that they had been requested by the public works department of Pittsburg to formulate a rating of boilers of different types and with different furnaces and settings, for adoption by the city with a view to putting an end to the installation of plants so inferior in capacity that they could not be worked without producing smoke. This work is to be commenced by the committee at once, but will involve a great deal of labor. The committee fully recognizes the opportunity for criticism of any such formulation by parties interested, and will therefore go over the ground very thoroughly.

It was pointed out at the meeting that while the finances of the society were in very good shape, the income being fully sufficient to meet the current expenses, the general prosperity in the iron and steel and engineering lines was such that the present ought to be an auspicious time for the raising of funds for permanent improvements in the society, such as a large addition to the library and providing the society with a home of its own. After some discussion a committee, to be appointed by the chair, was authorized to solicit subscriptions for the purpose.

The membership of the society has been steadily increasing of late. At the meeting the following were elected to membership, their names having been recommended by the board of direction at the previous meeting: James Bonar, M. E., manager James Bonar & Co., Pittsburg; Joseph Fawell, M. E., chief mechanical engineer for Mackintosh, Hemphill & Co., Pittsburg; Michael Greenwood, Pittsburg agent for Laidlaw-Dunn-Gordon Co.; Arthur Herschmann, Pittsburg representative Wm. Sellers & Co.; Rees James, superintendent open-hearth department Homestead Steel Works; Walter Jenks, superintendent La Belle Steel Works, Allegheny City; John W. Parker, chief inspector Homestead Steel Works; Henry B. Prather, M. E., Cleveland, manager Buffalo Forge Co. for Central Western district; J. E. Schlieper, M. E., manager Pittsburg Feed Water Heater Co.; J. E. Schwab, general superintendent Duquesne Steel Works and Duquesne Furnaces; Loren H. Turner, superintendent motive power and equipment, P. & L. E. R. R.

The following names were presented by the board of direction and will be voted on at the next monthly meeting: William Ahlen, chief draughtsman Duquesne Steel Works and Duquesne Blast Furnaces; Carl B. Aull, Westinghouse Air Brake Co.; Chas. H. Bradley, Jr., of C. H. Bradley, Jr., & Co., engineers, Pittsburg; Reinhardt Daae, draughtsman with Julian Kennedy, Pittsburg; George W. Knotts, mechanical engineer at National Rolling Mill department of National Tube Works Co., McKeesport; Frank S. Loeb, metallurgist and assistant superintendent Duquesne Reduction Co, Pittsburg; Robt. McLaughlin, draughtsman, Westinghouse Machine Co. East Pittsburg; Henry Otto, master mechanic Shoenberger Steel Works, Pittsburg; William O. Renkin, mechanical draughtsman Pittsburg Plate Glass Co., Pittsburg.

The paper of the evening was read by Mr. Chester B. Albree, on

The Use, Design and Manufacture of Iron in Ornament.

This paper was listened to with the greatest interest, as the members, whose attention is usually wholly devoted to the use of iron for practical purposes, were surprised at the wide field of employment for iron in an ornamental way as shown by the paper. Following a number of drawings illustrating ancient decorative uses of iron, several hundred engravings were presented showing the best specimens of modern ornamental iron work and manufactured by several establishments in the United States and in foreign countries. These engravings were passed around among the members. Some of the points touched upon by the paper are here presented.

In the museum at Pompeii there is a great variety of iron objects which were recovered from the ruins. Among these are iron window frames with glass lights, although for centuries after the destruction of Pompeii the art of glass making remained lost. In the middle ages the main use of iron was for armor and other appurtenances of war. Until comparatively recent times the iron for these uses was the product of the Catalan forge. The use of iron for ornament was of later date, the practice gaining ground of adding scrolls to the hinges, working andirons into grotesque shapes, ornamenting gates and windows, etc.

A peculiar style which developed in the Austrian work was the interlacing of round bars, forming a sort of lattice, each bar passing alternately through a bar and being passed through by the next bar—a kind of work which cannot be done in modern times, even with the superior facilities at command.

Toward the close of the last century the use of cast iron came into vogue in the United States, and the first tendency was toward the most elaborate and grotesque forms in decoration. Where cast iron supplemented brick and stone a studied effort was made to imitate the appearance of the material, even to the reproduction of the mason's chisel marks. The evolution toward the more practical and truly artistic forms has progressed steadily up to the present day.

A modern office building is a triumph of engineering skill and much of the material is iron, but the architect in most cases has contributed but little. The designing of a 15 or 20-story office building was a new problem, and to meet the absolutely necessary conditions distracted attention from the ornamental feature, which is only now being gradually evolved. The covering of plate girders in such buildings with material to represent stone lintels has produced a most ridiculous appearance in many buildings when the supporting power of real stone lintesl is considered.

The bridges and viaducts of the country have not been handled even so well as the office buildings, and are as a rule gaunt, unsightly skeletons. An instance may be cited in the Fairmount bridge across the Schuylkill river in Philadelphia, leading to Fairmount Park. The roadway is furnished with massive cast iron railings and corbels which are made in imitation of cut stone work. The real supporting parts, the diagonal members, eye-bars, etc., are in their natural form and at a distance are almost imperceptible, giving the appearance of a ponderous mass of masonry resembling an old Roman aqueduct suspended in the air as if by magic.

The growth of scroll work has been steady and this now forms an important branch of modern iron decoration. The scrolls are sometimes welded together, at other times connected where they cross by small encircling bands, butted, and sometimes these bands have their ends dovetailed into each other. An infinite number of combinations may be made of simple C and S scrolls, and some very fine samples of this kind of work were shown by engravings. All over Europe are beautiful specimens of such work.

Much of the early relief work was done by a process which was the forerunner of the modern drop forging system. A carefully wrought original was first made, then a matrix was produced by pressing hot metal upon it, to form an intaglio, from which many duplicates could be made by pressing the hot metal upon it.

The fine iron castings required for much of the modern decorative iron work, such as for stairs, railings, etc., are produced as follows: A wax model is first made by the artist, then a plaster cast is made from this, and from the plaster cast an iron casting similar to the wax model is produced. This casting is carefully tooled or machined and becomes the pattern for molding in fine sand, by which any number of commercial castings can be made These castings are cleaned and some parts polished, while in the best work electroplating is employed also.

In the manufacture of ornamental iron for fences, railings (in bridges and elsewhere), ornamental roofs, etc., a great deal of skill is required of the manufacturer in devising methods of manufacture which will produce the work at a price permitting of its use. There are a great many duplicate parts to be produced, and in assembling the work must be done with as little labor as possible. The great variety of rolled shapes on the market permits of considerable selection in the first place, and much labor saving machinery is devised to shear, punch, cut and bend these shapes. For the production of a spiral from a flat bar, for example, a pattern is first produced of the required size and of a heavy bar. This is clamped in a vise, and one end of the heated straight bar is held by a tongs at the center of the pattern by one workman, while another walks around the vise holding the other end of the bar, which is thus coiled around, following the coil of the pattern closely. For twisting small sized square billets a heavy machine is used, the general principle being that of a lathe, the piece being gripped tightly at one end in the tailstock, the other end extending loosely into a square hole in the spindle in the headstock. The rotary motion holds it tight, and the work is all done cold, it being found that twisting hot did not produce the necessary regularity.

If there were a better understanding on the part of architects and designers of the actual processes of manufacture in ornamental iron work, progress would be more rapid because the designs would be made in harmony with the principles of economic manufacture.

A BLAST FURNACE PROBLEM WITH ZINC.

BY WILLIAM W. TAYLOR.

The iron ores of the Oriskany period, which arem ined and smelted in the western counties of old Virginia, usually contain a small amount of zinc. The amount probably seldom exceeds 0.10 per cent. Trifling as this small percentage may appear, it often occasions great trouble with the furnaces using these ores. The zinc does not ordinarily leave the furnace in the cinder, nor does it, in good practice, escape with the issuing gases. Under normal conditions, most of the zinc deposits on the cooler parts of the furnace walls as cadmia; while the remainder is carried over into the stoves and flues and under the boilers, and there deposited as impure, dust zinc-oxide. This fine material or dust zinc is of a loose, bulky nature, and can generally be easily removed by suitable brushes, etc.

The hard, stony cadmia, however, which attaches itself to the furnace walls, is by no means easy to remove, with a furnace in blast. The cadmia is a valuable by-product, and brings a fancy price from the zinc smelter. Following is a commercial analysis of this material:

Metallic zinc, 73.00.
Silica, 2.50.
Ferrous oxide and alumina, 3.00.

A fractured face of the cadmia, or "zinc-ring," in appearance is similar to Lake Superior agate, the yellow and green banded effects, combined with its great weight, giving it striking characteristics. The conditions best suited to its deposit on the furnace walls are hard driving and the accompanying cold tops. In the early days of iron making in Virgina, when little attention was paid to economy in fuel consumption, and with slow driving, trouble from zinc was scarcely ever known. The zinc seldom accumulated sufficiently to interfere with distribution of the stock. In recent years, however, with hard driving and low fuel consumption, often after only a few months' run the zinc will deposit on the upper walls of the furnace to such an extent as to seriously interfere with even distribution of the stock and consequently produce irregular working of the furnace. Not only this trouble, but there is constant fear lest the deposit suddenly break off and come down with the stock. Frequently this does happen and the effect is similar to what would happen were a huge block of ice to drop in front of the tuyeres. Constant dropping of the raw stock from the bell has weakened part of the ring. Suddenly it breaks off! The furnace making good, gray iron, in the morning, has now a silvery, brittle product at the 5 p. m. cast; or perchance if the quantity of zinc be large, it stops work altogether for a period.

At such a time, fumes of zinc oxide, that peculiar, greenish blue of burning zinc, are noted issuing from the open ends of the peep holes in the blow pipes. Occasionally metallic zinc will flow from around a tuyere, or go out with the cinder in a halo of smoke. A heavy coke blank is now needed to bring the furnace around. A few hours after, the trouble is usually over, for a while at least, the zinc runs out with the cinder, and the furnace gradually goes back on good iron, the only visible reminders being the piles of white brittle iron, the black heavy cinder and a deepening of the lines on the founder's face.

Fig. 1, shows the size and shape the "ring" sometimes assumes in a modern furnace. Less than half the volume of the furnace at the widest point of the ring is open for escaping gases. Note effect on stock distribution. Fig. 2 represents the probable relative positions of lump and fine materials charged, after the ring has assumed the size indicated in Fig. 1. Rounding lumps dropped on the bell would strike the ring and be deflected to a, here coming against the wall would again be deflected to b. The fine materials, however, would from their nature simply slide off the ring and remain at c. The charge, therefore, being more open at b, the furnace will drive harder on this side, producing slips and sticking, incident to one-sided working. There would naturally be a greater melting of the bosh walls on this side. This, in fact, is just what did happen in one case which came under my observation. The brickwork on the bosh was burned out in a large pocket, directly under the ring. The temperature of escaping gases from the furnace here represented was about 400 degrees F., and the ring weighed 60 tons.

By the courtesy of the Longdale Iron Co., I am enabled to illustrate the form the ring deposit takes at their plant. The two Longdale furnaces are each fitted with a central tube gas flue. A far better and very able description of the ring in the Longdale furnaces has been published in vol. 7, Transactions A. I. M. E., by Mr. Firmstone. It is the custom of the Longdale Co. to remove the zinc occasionally, with the furnace banked. The stock is allowed to settle, and after dumping in a few farrons of wet ore, the cadmia is cut off in sections, with tools for the purpose, and lifted out by a grapple invented by themselves for this use. The cadmia is sent down on the cage and sold to the nearest zinc smelter. Their ring seldom exceeds 12 tons in weight, and from its shape can easily be removed in sections. Furnaces, however, which have a gas flue at one side have a more difficult problem involved, as any attempt to break off the zinc by sections would meet with probable disaster. Pieces ranging from 20 to 30 tons are too heavy for a light tackle on a shaky hoist tower.

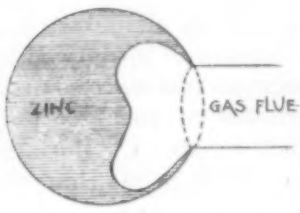

FIG. 1.

FIG. 2.

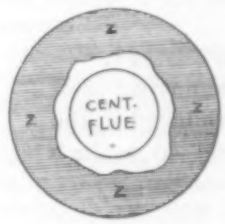

FIG. 3.

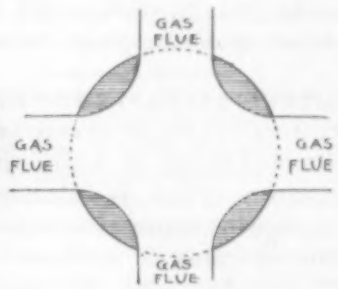

FIG 4

A BLAST FURNACE PROBLEM WITH ZINC.

It will be noted by inspection of Figs. 1 and 3 that there seems to be less tendency for the deposit to form where the passage of the gases is the greatest. This being the case, if the gases were led from the top by four or more flues, meeting in a common down-corner, the zinc would deposit to a less extent in the furnace and that which did deposit could be removed in sections small enough to handle. The tendency would be to the formation of a ring illustrated by Fig. 4. It would probably confine the zinc to the spaces between the gas flues, and thus not seriously interfere with even distribution of the stock. Longer blast could probably be made with such a furnace, a larger burden carried, with more uniform results. When inspection showed the zinc had formed to any considerable amount, the furnace could be banked a few days, and the zinc removed in small sections, with little danger.

Iron Gate, Va.

THE Brown Hoisting & Conveying Machine Company, of Cleveland, has begun the erection of an ore unloading and storage plant of unusual size at the works of a large furnace company at Mariopol, South Russia. The contract is worth in the neighborhood of $500,000. Orders for machinery have recently been received from furnace companies in Antwerp, Seraing, and Liege, Belgium; Valenciennes, France; Dortmund and Luxemburg, Germany, and three from Vienna, Austria. The company is also shipping to London two cantilever cranes valued at $80,000.

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AND
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THE INDEX to Vol. XXXI of *The Iron Trade Review*, Jan. 1 to Dec. 31, 1898, is now ready. It will be mailed to all subscribers who desire it.

EMPLOYERS' LIABILITY FOR ACCIDENT.

Manufacturers in Pennsylvania are having their attention directed of late to a bill introduced in the State Legislature which is calculated to make a sweeping change in the present status of employers' responsibility in cases of accident. The bill provides that "from and after the passage of this act all employes, in civil actions against any person, firm, company or corporation shall have all the rights in said action belonging to persons not so employed." This contemplates a similar radical change to that made in Great Britain last year when the "Workmen's Compensation Act" was passed by Parliament. This act set aside the time-honored and well established doctrine asserted by the law of "common employment." This was established in England in 1837 and recognized two fundamental principles—first, that accidents are liable to occur in all occupations, even with most careful management; second, the presumption that an employe voluntarily assumes the risks incident to his occupation and an action for damages therefore cannot lie against an employer, unless neglect of statutory duty on his part can be proved. The law of 1898, under which employes' insurance companies have taken large tribute from British manufacturers, recognizes no release of employers' liability for accident to workmen, unless due to wilful intention or culpable negligence on the part of the operative himself. Thus, not only are employers liable on account of pure accidents and for negligence on the part of others they employ, but also in cases where the accident arises from the negligence of the injured workman himself.

In the United States, even the negligence of a co-employe has been successfully urged by employers, to avoid liability for injury to a workman. The Pullman company goes farther and asks employes to sign a release of any claim for damages by reason of accident. This is as far wrong on one side as the British law is on the other. The proposed Pennsylvania measure aims to fasten upon that state a law going almost as far as the British statute, and we are not surprised at the movement by maufacturers to secure its modification. A scheme of accident insurance contributed to by employer and employes offers a solution of the question; and where the matter has been taken up in an amicable way agreements have been made in individual instances that have avoided litigation, without imposing heavy burdens. The plan of insuring against litigation, followed to some extent, has not proved a solvent; it has only changed the parties to the law suit, and is cold-blooded, often inequitable.

IT is gratifying to note that the demands for advances in molders' wages in two important foundry centers have resulted in an amicable adjustment of the matter, satisfactory to both sides. Local foundyrmen's associations in Cincinnati and Cleveland, both attached to the National Founders' Association, have been instrumental in making this settlement without a strike and without any serious friction. The foundrymen concede a 10 per cent advance in wages, as in line with better conditions throughout the iron trade and in all industry; and the molders agree that in view of low-priced work now in the shops, on contracts that have some time to run, it would be equitable to postpone the enforcement of the advance to May 1. But a more important and significant result of the conferences between officers of the molders' union and of the foundrymen's local associations, is an agreement for annual conferences to adjust wages, so that the year shall be free from strikes and ill feeling and losses due to the constant agitation of wage advances. The agreement also provides for the entire suspension of work on each alternate Saturday in June, July and August, while the remaining Saturdays are to be full work days. There is, in addition, a provision for pay for over-time and one for the adjustment of individual grievances. It is understood that Detroit and Buffalo will follow the example of Cleveland and Cincinnati; and with the movement thus well started its extension to other important centers should not be difficult. It is a pleasure to see such success attending one of the most salutary movements yet undertaken in any industry. Those who have had faith in such a development of the foundry association idea are entitled to high praise for their foresight, their persistence and for their broad-minded and intelligent advocacy of organization for defense and conciliation.

THE Lewis Foundry & Machine Co., Pittsburg, will soon begin making shipmnts on the Garrett rod mill it is building for the Phœnix Actien-Gesellschaft für Bergbau und Huetten-Betrieb Abtheilung Westfaelische Union, the government steel works and rolling mill at Hamm, Westphalia. There are two stands of 18 inch rolls, seven stands of 16-inch rolls, and two finishing stands 14 and 11 inches respectively. The order includes the mills tables, etc.

THE Johnstown, Pa., plant of the American Tin Plate Co. started in operation Monday of this week, with W. H. Harris, formerly of the Baltimore Tin Plate Co., as manager.

PERSONAL.

Geo. J. Humbert, who was president of the Humbert Tin Plate Co., South Connellsville, Pa., has been appointed district manager for the group of American Tin Plate Co. mills consisting of the Connellsville, Demmler, West Newton, Cumberland and Blairsville plants and the Marshall plant at Philadelphia. He succeeds Barthold Goldsmith, who goes to Elwood, Ind., to take charge of the original American Tin Plate Co.'s 26-mill plant.

Geo. Bermond, a French metallurgical engineer, has been visiting the important iron and steel districts of the United States, in the past few weeks.

Hjalmar Lundbohm, of the Geological Survey of Sweden, is now in the United States, investigating particularly the Lake Superior and other ore deposits of the country. He has been on the Lake Superior ranges and is spending this week in the Pittsburg district.

Frank B. Ward, recently appointed to have charge of the Cleveland branch office of Manning, Maxwell & Moore, was for several years the secretary and general manager of the Michigan Brass & Iron Works, of Detroit, Mich., and previous to that acted as manager of the Chicago office of the Brown Hoisting & Conveying Machine Co.

Frank Baackes, general superintendent of the American Steel & Wire Co., will make his headquarters in the Cleveland offices of the company.

Edward M. Allen, of the engineering staff of the Cambria Steel Co., will take charge of the engineering department of the Frank-Kneeland Machine Co., of Pittsburg.

Walter C Stone, formerly in charge of the Salem Wire Nail Co.'s mills, has become manager of the New Castle plant of the American Steel & Wire Co. John D. Curtis, superintendent of the Quinsigamond works of the Washburn & Moen Mfg Co. for several years, has been made superintendent of the Grove street works, succeeding Frederick H. Daniels, who becomes chief engineer of the American Steel & Wire Co.

J. D. DuBois, who has been connected with the Wheeling Steel & Iron Co. for many years as secretary, has resigned and has gone to Cuba for a brief sojourn. Frank W. Bowers, formerly treasurer of the Caldwell & Peterson Mfg. Co., Wheeling, has been elected secretary and Wm. H. Higgins assistant secretary of the company.

The Cast Iron Pipe Consolidation.

The United States Cast Iron Pipe Co. completed its organization the past week, and has formally taken over the properties named in the list originally printed. The capital is $30,000,000, equally divided between common and preferred stock. Of this amount $12,000,000 of each class is issued. The following directors have been elected: Colgate Hoyt, A. C. Overholt, B. T. Overholt, L. R. Lemoine, George B. Hayes, C. E. Burke, E. C. Fuller, W. C. Proctor, B. F. Haughton, George J. Long, A. F. Callahan and F. C. Miller. Eleven of the directors are manufacturers. Colgate Hoyt represents the Rockefeller interests. The officers are: President, A. C. Overholt; vice-president, A. F. Callahan; secretary, B. F. Haughton; treasurer, George B. Hayes. President Overholt has been chairman of the National Foundry & Pipe Works, Ltd., Scottdale, Pa. Mr. Callahan has been for many years prominent in the management of Dennis Long & Co., Louisville. The underwriting has been largely oversubscribed and the manufacturers owning the constituent companies have subscribed liberally to the stock of the new company.

The Bar Iron Consolidation.

It is stated that the subscription books for the rolling mill combination were opened in New York Monday of this week. A meeting has been held at which the principal parties in interest were present. It is represented that the proposition is to pay cash for all stock and material on hand, and to pay stock for the plants, share for share, which Youngstown advices say has been met with objection from some of the stockholders in plants there. The leaders in the movement have been in New York the past week, and something definite is looked for soon. It is understood that some obstacles in connection with the financiering of the combine have been encountered.

LAKE SUPERIOR IRON MINES.

The Oliver Iron Mining Co.'s properties in the Iron River district on the Menominee range have been added to by the purchase of the Dober mine from the Mastodon Iron Co. The ore shipped last season from this property averaged 61.78 in iron, 0.55 in phosphorus, 2.20 in silicon, 2.40 in alumina, and 5.75 in moisture.

Capt. Joseph Sellwood, of Duluth, who has been vice-president of the Duluth & Iron Range road for a number of years, and closely identified with the mining interests of the Minnesota Iron Co., has severed his official relations with these companies. It is reported that he will have charge of a number of Gogebic range properties, including the Iron Chief, Sunday Lake, Brotherton and Chicago. With the exception of the original properties secured by the Minnesota Iron Co. from Charlemagne Tower—the hard ore mines at Tower, Minn.—every property the Federal Steel Co. has in Minnesota was bought at Capt. Sellwood's suggestion and on his reports. The mines included are the Fayal, Genoa, Elba, Chandler, Canton, Auburn, Norman and others. He is probably more thoroughly familiar with mining developments in Minnesota than any other man and has been a prominent figure on the Mesabi and Vermillion ranges from their beginnings.

The Sauntry mine in the Virginia district, recently acquired by the American Steel & Wire Co., brought $700,000 according to reliable report. The ore runs above and below 60 per cent in iron, averaging about 59, and is generally high in phosphorus. There is a mixture of grades, and water is something of a drawback to easy mining. With the acquisition of this property there is very little in the way of fees or good leases on the Mesabi range that has not been taken up. Practically everything that has been regarded as available has been taken of late either by transportation or steel-making interests.

Some estimates recently made of the probable output of Minnesota iron mines in 1899 give the following figures: Vermillion range—Chandler, 900,000 tons; Minnesota, 500,000; Oliver mines, 600,000. Mesabi range—Fayal, 900,000; Genoa, 300,000; Sparta, 275,000; Auburn, 250,000; Elba, 150,000; Canton, 125,000; Hale, 50,000; Roberts, 50,000; Biwabik, 450,000; Adams 500,000; Hull, Rust, Burt, Sellers, Pillsbury, 600,000; Franklin, 150,000; Ohio, 150,000; Duluth, 150,000; Commodore, 100,000; Mountain Iron, Oliver and Lone Jack, 1,400,000; Mahoning, 650,000; Penobscot, 50,000. In the case of the Canton the estimate is on shipments from stock pile, as the mine is not to be wrought. The total of the estimates, which may be taken as maximum figures, is is 2 millions for the Vermillion range and 6½ millions for the Mesabi range.

South Chicago Furnace Co.

The Calumet furnace and rolling mill property at South Chicago was purchased the past week by the South Chicago Furnace Co., just organized by Chicago and Cleveland capital. The Chicago stockholders are for the most part identified with the Illinois Steel Co. The capital is $300,000 in $100 shares distributed as follows: Samuel Mather, 250; Harvey H. Brown, 250; Charles H. Fuller, 100; W. L. Brown, 200; Walter F. Cobb, 200; E. J. Buffington, 100; C. P. Wheeler, 100; Charles H. Foote, 250; D. M. Cummings, 1,000; Charles Deering, 300; C. H. Garvey, 100; Fred. H. Foote, 50; W. L. Brown, 100. Total, 3,000. All the shareholders are Chicago men except Samuel Mather and H. H. Brown, who reside in Cleveland. The officers are: President, W. L. Brown; vice-president, D. M. Cummings; secretary and treasurer, B. W. Wells. The tract contains about 56 acres, except the railroad right of way. The plant includes a bar iron mill, blast furnace, and five miles of railroad track. The property was foreclosed under a first mortgage about two years ago, and was purchased at that time by the Northern Trust Co. for the holders of the first mortgage bonds for the amount of the decree, $374,088. A master in chancery transferred it to the new company at the same figure.

The 34-inch universal mill being furnished under direction of Julian Kennedy, Pittsburg, for an Austrian mill will be shipped in about three weeks by the Lewis Foundry & Machine Co., Pittsburg. The mill will have steel rolls, the vertical rolls being furnished by the builders, while the horizontal rolls will be made in Austria.

NATIONAL STEEL CO.

In connection with the scarcity of steel, of which mention has been made in market reports recently, the future of the billet and sheet bar trade of the Central West has been a matter of interest since the formation of the National Steel Co. The close relation between this company and the American Tin Plate Co. appeared on an inspection of the directorate of each; yet the American Tin Plate Co.'s consumption of sheet bars, even though it should buy all from the National Steel Co., would be only about one-fourth the latter's output of steel. Contracts for a term of years by which a part of the tin plate company's 425,000 to 450,000 tons will come from other sources are a matter of common understanding in the trade. It is plain, therefore, that the National Steel Co. is to manufacture and sell steel in the general market in the same way that the business was conducted by the constituent companies. It is understood that the policy of the new company, as it will be developed under the well known steel manufacturers who are active in its management, will involve no change in the operations of the constituent companies, nor will it change their relations with the customers who have depended upon them heretofore for material. It is the expectation that by working the various steel plants together to the best advantage, the wants of the trade will be better and often more promptly taken care of than under the regime of distinct and independent managements. The recent temporary inability of consumers of steel to get quotations, while due in part to the crowded condition of order books, and to the uncertainty all branches of the trade have felt about the course of prices, is to be attributed in some measure also to a reluctance to assume responsibility for the company which was being formed, so far as later deliveries were concerned.

With the formation of the National Steel Co. this difficulty has been removed. From its offices in the Marquette Bldg., Chicago, the company has been quoting prices in the past week, having announced its readiness to take up the matter of a steel supply with any of the customers of the constituent companies, or with any consumer of its products—blooms, slabs, billets, sheet bars and tin plate bars. The finished products heretofore made by the Union Iron & Steel Co., of Youngstown, and the Ætna-Standard Iron & Steel Co., of Bridgeport, O., will be turned out from these plants as before and sales will continue to be made from the Youngstown and Bridgeport offices. All the mills of the National Steel Co. are crowded for early deliveries, as are steel works and rolling mills in every other district; but with the disposition shown on both sides of the steel market in the past week or 10 days to consider midsummer and later business, it is probable that considerable transactions will be reported soon.

It is the evident purpose of the new company to preserve the old regime in its relation to the buying trade. What benefits are to come of consolidated management and unified practice can be better gauged as time goes on. Certainly the personnel of this, as of some of the other consolidations in iron and steel, suggests that every effort will be put forth to demonstrate that concentration, in the iron trade, at least has benefits for both consumer and producer.

Heyl & Patterson Casting Machine.

The pig iron casting apparatus designed by Heyl & Patterson, engineers and contractors, Pittsburg, and manufactured under their patents, is now being put upon the market. A plant of these machines has been in operation at the furnaces of the Cambria Steel Co., Johnstown, Pa., for the past three months, and they are reported to be successful beyond expectation.

SINCE the original acquisitions of properties by the National Steel Co., transfers of two of the plants for which deals had been made, have been completed, and the stock set aside for this purpose has been issued. The total now is $26,000,000 of cumulative 7 per cent preferred stock and $32,000,000 of common stock, leaving in the treasury $1,000,000 of preferred stock.

Samuel Work, who was employed by the Cambria Iron Co. for 12 years as superintendent of its furnaces at Johnstown, died March 24, aged 61 years.

OBITUARY.

Many friends on this side of the water will join in the deep regret expressed by the engineering and iron trade press of England at the death of Jeremiah Head, the well-known London engineer, who died on March 10, after an illness of several months. Mr. Head will be remembered particularly in connection with the Otis Steel Co., of Cleveland, for which he has been consulting engineer for several years. His trips to the United States were numerous and he had visited most of the important iron and steel plants in the country. The last result of his investigations here was a paper prepared in collaboration with his son, Archibald P. Head, for the winter meeting of the Institution of Civil Enginers at London, on the "Lake Superior Iron Ore Region." Of Mr. Head's ability as an engineer his associates speak in terms of high praise. Born in 1835, he was "articled" to Robert Stephenson, M. P., the celebrated engineer, serving his time in the well-known locomotive and marine engine building works at Newcastle-on-Tyne In the early '50's he supervised the building of engines, and in 1863 became partner in a large iron plant at Middlesbrough, continuing in this enterprise until 1875. From that time Mr. Head has been devoted to professional engineering, designing and building a number of iron and steel plants, and coke and gas-making works He was frequently retained as a technical expert in important arbitrations, often as sole arbitrator. He assisted in appraisals representing millions of pounds. Mr Head will be well remembered for his contributions to technical associations, his work of this character covering a wide range He was a clear and vigorous thinker and speaker, and ranked high as a metallurgist and all-around engineer.

R. A. Tilghman, of Philadelphia, inventor of the sand blast, died on March 24. He was of a Maryland family, several members of which were in the Revolutionary War.

Edward S. Taber, president of the Morse Twist Drill & Machine Co., died at New Bedford, Mass.

William Eberhardt, of Allegheny, Pa., who was interested in the project for the building of a sheet mill at Chester, W. Va., by the Chester Rolling Mill Co., died this week of pneumonia.

Edwin Le Roy Harrington died at Philadelphia, March 18, of pneumonia, aged 45. Mr. Harrington was engaged in machine tool manufacturing with his father under the firm name of Edwin Harrington, Son & Co. Eight years ago he retired from active participation in business.

The Cincinnati Iron Market.

March 28.

The week that has just closed was satisfactory in the amount of business that was done, although in this respect it would scarcely bear comparison with the more active weeks that immediately preceded it. A good many large consumers came into the market and after testing it thoroughly concluded not to buy. Apparently they argue either that prices are not going to be higher later on when they will have to buy, or that they can better afford to pay high prices then than now. At all events, they put off purchasing. It is stated by sellers of pig iron, however, that there is quite a heavy tonnage of business to be placed this side of July 1, and they do not see how there can be any change for the benefit of the buyer for months to come. Selling firms report that the essential facts in the situation are being steadily intensified; that is, the great scarcity of pig iron combined with a steady, accelerating consuming demand. As to what the general spring business is going to be, and as to what the tendency of the foreign markets will be during the next month, much is depending. If, as many believe, the general expansion of domestic and foreign business is to go on, then a continued strong market is inevitable. There can be no increase in production of pig iron until a fresh supply of Lake Superior ores come into the market, which, of course, cannot be turned into pig iron until after navigation opens, so that the present scarcity of visible iron is to be keenly felt for at least 60 days further. The market closes firm. The figures below represent approximately the transactions of the week. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $15.25; No. 2, $14.25 to $14.75; No. 3 $13.75 to $14.25; No. 4 and gray forge, $13 to $13.50; mottled, $13 to $13.50; No. 1 soft, $15.25; No. 2 soft, $14.25 to $14.75; Lake Superior coke, No. 1, $16 to $16.50; No. 2, $15.50 to $16; Hanging Rock charcoal No. 1, $17 to $18; Jackson Co. silvery No. 1, $16 to $16.50; Standard Georgia car wheel, $15.75 to $16.50; Hinkle L. S. Charcoal, $16.75 to $17.25.

CLAMPS IN SHOP AND FOUNDRY.

Several illustrations are given below of devices that not only have proved a convenience but a tangible economy in machine shop and foundry operations. The facility and speed with which the operative can secure his work, whether with clamps or wedges, will cut no small figure in a year's operations in a shop of only moderate size. Improved clamps of various types have been offered. Where these are to be used in the foundry, it can be appreciated that the clamp that can be tightened with the least jarring will find readiest favor. A clamp operating by a tilting device and adjustable to varying lengths still requires blocking or wedges; and another using a wedge-shaped tightener requires a slight rapping to lock it. In the case of the adjustable clamp, manufactured by the E. E Josef Mfg. Co., of Buffalo, shown in Fig. 1, tightening is accomplished by giving the pawl half a revolution.

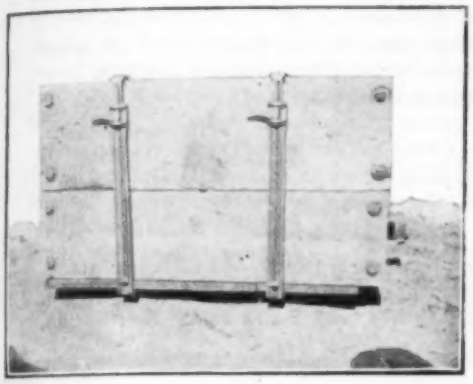


FIG. 1.

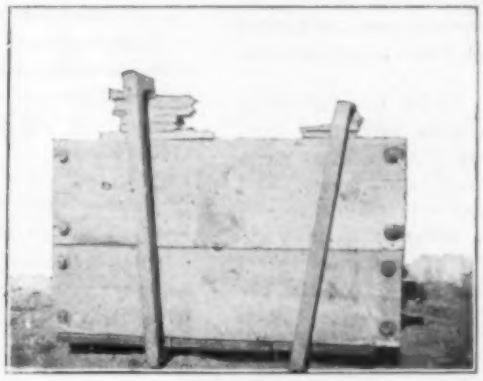


FIG. 2.

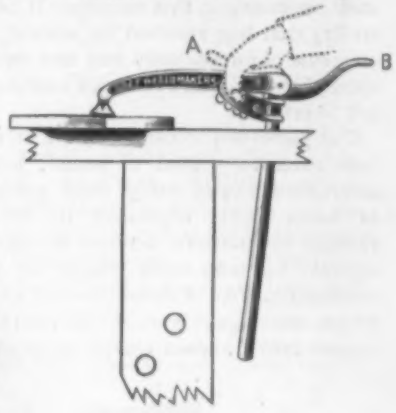


FIG. 3.

The back part of the clamp has a thread cast upon it which in tightening engages with a similar thread on one side of the pawl. The principle of operation is that of a screw, the pitch being sufficiently coarse to permit of drawing the two main parts slightly together. The perpendicular position is maintained, it will be seen. In Fig. 2 are shown ordinary clamps as they often appear with the use of wedges. It is stated that less than one minute is required for placing four of the Josef clamps. The time spent in the average foundry in clamping flasks, where wedges are used, and, as often, additional blocking is several times as long. It is said that a dozen clamps to a floor would prove sufficient in ordinary work.

FIG. 4.

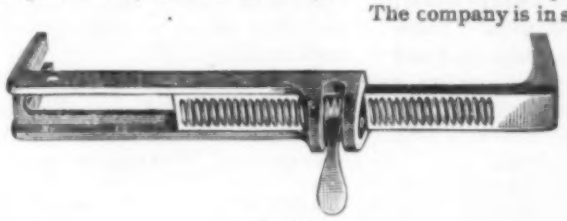


FIG. 5.

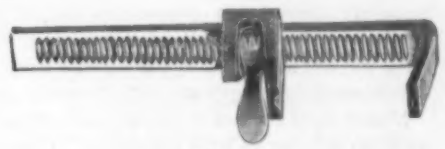


FIG. 6.

Fig. 3 shows the Buffalo universal handy bench clamp, as manufactured by the same company, for shop work. It is in use by pattern makers and other wood workers, by machinists and wagon makers. It may be placed also on the leg of a bench, and treated as a bench screw or vice. In clamping a pulley to the bench for tapping a set screw hole in a hub, or in many operations in which the work must be well secured, it is of value. Fig. 4 shows the bench clamp as folded up to be placed in a tool chest. Fig. 5 is the flask clamp No. 2 of the same manufacturers, and Fig. 6 is the core box clamp No. 1. The flask clamps adjust themselves to any flask and when in position are free from projecting parts, making it possible to roll the flask without disturbing the fastenings.

Sprocket Chain Mfg. Co.

This company, recently organized for the manufacture of malleable iron castings at Detroit, Mich., by Theo. D. Buhl, Alex. McPherson, and L. B. Ball, each holding one-third of the stock, was incorporated last week with a capital stock of $75,000, of which $30,000 has been paid in. The officers of the company are Theo. D. Buhl, president; Alex. McPherson, vice president and treasurer; L. B. Ball, secretary and manager. Mr. Buhl at present is president of the Parke-Davis Co., president of the Buhl Stamping Works, chairman of the Detroit Sprocket Chain Co., Ltd., senior member of Buhl Sons & Co., wholesale hardware, vice president of the Detroit National Bank, director in the Detroit Copper & Brass Rolling Mills Co., and for many years president of the Michigan Malleable Iron Co. Mr. McPherson is president of the Detroit National Bank, and Mr. Ball is secretary and superintendent of the Detroit Sprocket Chain Co., Ltd.

The plant, located at the corner of Adair and Wight sts., upon property owned by Mr. Buhl, is being thoroughly refitted and rebuilt with the best modern appliances throughout and will be in operation April 1. The superintendent, Mr. Andrew Bruce, has been engaged in malleable iron work for the past 30 years—for 10 years as superintendent of the Dayton Malleable Iron Co., four years as superintendent of the Champion Works, Springfield, O., three years as superintendent of the Missouri Malleable Iron Co., St. Louis. He is a thoroughly practical man in his line. The product of the new company will consist principally of small malleable castings. The company is now ready to quote prices on general work. It is well provided with stock of iron to meet demands for some time and is prepared to execute promptly any new orders, while starting out with a good line of contracts already booked. Although the name is somewhat similar to the Detroit Sprocket Chain Co., Ltd., the organization is entirely distinct, but it is not a competitor in any particular with that company. The company is in strong hands financially and it is the intention to utilize the large tract of land under its control by enlarging the plant as fast as the growth of business warrants.

WORK began March 27 in modernizing the old plant of the Calumet Iron & Steel Co. at Irondale, Chicago, by the new South Chicago Furnace Co. The plant is to have a capacity of 90 000 tons of pig iron a year and will be in active operation by June 15. W. L. Brown is president of the new company. The furnace has not been operated for several years. The property includes a blast furnace, a bar mill, five miles of railroad tracks and 60 acres of land between 106th and 110th streets.

IT is announced that ten of the 30 mills in the Shenango Valley plant of the American Tin Plate Co. will be put in operation next Monday. The plant has been practically completed for some time, but the scarcity of steel has prevented the beginning of work.

THE Tyler Tube & Pipe Co., Washington, Pa., will advance wages 10 per cent., beginning next Monday.

ADVANCES IN THE MANUFACTURE OF HIGH-GRADE BOILER AND PIPE STEEL.*

Increase of steam pressures brings properly a demand for the very best material with which to construct boilers Reliability is the desideratum, as no element of the construction can be defective without imperiling the whole, and with it jeopardizing the lives of those in charge of the plant. Of late years, and indeed ever since mild steel set out to replace wrought iron, there has been continuous and rapid progress in the art of manufacturing this material, until any desired quality can be uniformly produced, by the most careful makers.

Undoubtedly the government inspections and the tests that have been imposed by the Bureau of Steam Engineering of the U. S. Navy Department, for all materials before acceptance, have wonderfully assisted in the advances in the art of steel producing in this country. It has stimulated a beneficial rivalry that has resulted in almost entirely eliminating the elements of unreliability and non-uniformity from the forged steel of to-day, and even with cast steel there is to-day little left to criticise.

Comparatively recently nickel steel, which has for years been extensively used in armor, has been attracting considerable notice as being most admirably adapted to parts of boiler work, especially to bracing and rivets, and through the patriotic interest of some of our manufacturers we have had tests made which are as valuable as they are interesting. One of these series of tests† was with nickel steel rivets, which gave a tensile strength of over 75,000 lbs. per square inch, and an elastic limit of over 40,000 lbs. Such material as this enables designers to use much smaller rivets, thus cutting away much less of the oirginal plate. These rivets also have quite a fair range of heat at which they can be safely driven, the precaution being not to go above a bright cherry red. They also proved to be tougher and freer from the brittleness of heads formed by sledge and cup sets, which sometimes appears with common steel rivets.

Nickel steel for boiler braces and rods possesses a superiority quite as definite as with the rivets. Chemical analyses give: Carbon, 0.23; sulphur, 0.017; manganese, 0.61; nickel, 3.22; and phosphorus, 0.021. Its average tensile strength is over 80,000 lbs. per square inch, with an elastic limit of 55,000 lbs. per square inch, and an elongation of more than 23 per cent in eight inches, with a reduction of area of 55 per cent It is very uniform and exceedingly reliable. When subjected to a drop test it tears a grain at a time, holding together for many blows after fracture begins. In several cases where bars of this composition four inches in diameter were tested by dropping a weight of 1,640 pounds upon them from a height of 44 feet, the bars being supported at their ends only, and after each drop the bars were turned over to put the convex part of the resultant bend always uppermost. It required 40 blows of this nature before fracture began, and 40 additional blows to complete the break.

Government naval specifications for boiler materials for 1898 are much more rigid than for any previous year. Take for example the single factor of tensile strength of shell plates. In 1897 the ultimate limits were 58,000 and 67,000 pounds, with an elastic limit of at least 32,000. In 1898 these limits were raised to 74,000 pounds and 82,000 pounds, with an elastic limit of 40,000 pounds.

Specifications for boiler materials for 1898 require open-hearth steel plates showing not more than 0.035 per cent, of phosphorus or 0.03 per cent of sulphur. There are three grades of plates:

	Tensile strength	Elastic limit.	Elongation in 8 ins.
Class A, No. 1	74,000 to 82,000	40,000	21 per ct.
" " 2	66,000 " 74,000	36,000	23 "
" " 3	60,000 " 66,000	33,000	25 "

There are also the usual requirements regarding surface and other defects, and only the cold bending test is used. Allowable variations of weight and gage are as follows:

	Weight, per cent. Above.	Weight, per cent. Below.	Gage, below, in.
Plates more than 110 ins. wide	7	2	0.06
" from 100 to 110 ins. wide	6	2	0.05
" " 80 to 100 " "	5	2	0.04
" " 60 to 80 " "	4	2	0.03
" less than 60 ins. wide	3	2	0.02

Boiler Braces.—These are of open-hearth steel of same chemical composition as boiler plates annealed as a final process, and the test requirements call for:

	Tensile strength lbs. per sq. in.	Elastic limit.	Elongation, per cent. 8-in. piece.	Elongation, per cent. 2-in. piece.
No. 1	74,000	40,000	22	26
No. 2	66,000	36,000	24	28
No. 3	60,000	32,000	26	30

Three cold bending tests are required, one for each grade, using a bar ½ inch thick, the ends being brought parallel, using radii of 1-inch, ½-inch, and a flat fold. In addition, there is an opening and closing test requiring angles, T-bars, and other shapes to stand opening out flat or closing down face to face.

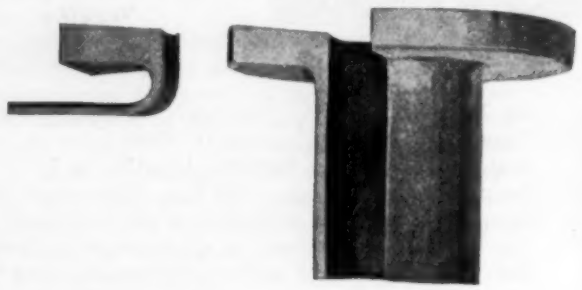


FIG. 1.—STEEL STEAM PIPE, WITH WELDED FLANGE; SECTION REMOVED AND BENT TO SHOW PERFECT WELD.

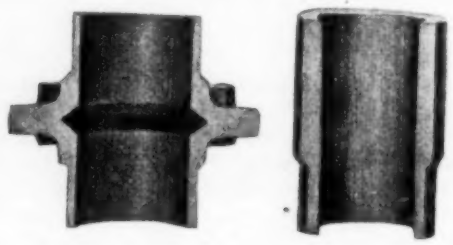


FIG. 2.—SPUN FLANGES, FOR STEEL STEAM PIPES SHOWING THE UPSET END BEFORE SPINNING AND SECTION OF FINISHED JOINT.

Rivet Rods and Finished Rivets—May be of two classes, high grade, Class A, with the same chemical composition as boiler plates, and Class B, made by the open-hearth or Bessemer process. The tensile requirements of these are:

	Tensile strength, lbs. per sq. in.	Elastic limit.	Elongation in 8 ins.
Nickel steel	75,000 to 85,000	40,000	23 per ct.
Class A	60,000 to 68,000	32,000	26 "
Class B	54,000 to 62,000	30,000	29 "

In addition both cold and quenching tests are required. Also a hammer test of finished rivets, in which specimens must stand flattening cold to a thickness of half the original diameter, and a hot-test to one-third the original diameter.

The specifications for various forms of tubes used were given briefly in *Engineering News* for Jan. 9, 1899. It might be stated in addition that all tubes must stand an internal hydrostatic pressure of 1,000 pounds, and if the tube ends are flanged, swedged down, swelled, upset or reinforced, they must be tested after the process. Boiler tubes, fittings and steam and water pipes are now, of course, subjected to increased pressure, and are objects of as much concern regarding their trustworthiness and perfection as is the boiler proper. Steel is the material for these parts best adapted to the conditions.

In the advances of seamless-drawn pipe making, it has become possible to make both T's and crosses in this manner. As these are necessarily of the very highest grade steel, the advantages they possess over the bulkier and less reliable castings usual to such forms are obvious, and especially for the express type of boiler work where reduction of weight,

* Abstract by the *Engineering News* of an article in the Journal of the American Society of Naval Engineers for February, 1899.

† Journal of the American Society of Naval Engineers, November, 1898.

provided it does not decrease strength or reduce longevity, is most desirable.

Great improvements have been made in the method of obtaining excellence in the matter of pipe flanges for high pressures, and the results up to the present time have been not only highly satisfactory, but embrace features of novelty and interest as well. With the adoption of steel for high pressure steam pipes came the necessity of making sure that defects should not develop in the flanges. Not only is the element of danger one to be thus guarded against, but also the issues of economy which are so seriously damaged by leaky joints. The flanges must be substantial, and heavy enough to permit of properly making and holding the junctions of sections and preserving the integrity of the system, and at the same time they must be as nearly a portion of the pipe itself as is possible to make it. Hence the superiority of a perfectly-welded flange over the old brazed and riveted flanges of our lower-pressure copper pipes, or the riveted and calked flanges of wrought iron pipes. Fig. 1 shows how perfectly this work of welding flanges is now done; and it is applied equally readily to pipes of one inch and as high as 30 inches in diameter. Also there is no necessity of the metal of pipe and flange being alike, as an iron flange can be welded either to a steel or iron pipe. These flanges are cut from a solid plate.

The test here shown was made by cutting a section for a selected pipe as shown in the figure and bending the strips of pipe parallel to face the flange, the bend being in the weld. The perfection of the weld is thus clearly shown, and with a seamless-drawn pipe and a solid cut flange there is little room to criticise the result in points of either solidity or finish.

The thickness of pipe desired in order to make the weld properly is given as follows: Two-inch pipe should be No. 6 B. W. G. thick; four-inch pipe should be No. 4 B. W. G. thick; five and six-inch pipe should be ¼-inch thick; eight-inch pipe should be 5 16-inch thick. Pipes can be solid drawn up to eight inches diameter.

In the matter of flanging, however, there has been produced a more remarkable result than the above with low-carbon steel of finest grade, following the lines of "spinning" the metal. This is shown by the samples in Fig. 2. The lower piece represents a heavy "upset" two inches long on a No. 8 B. W. G. seamless-drawn boiler tube. The upset end was then swelled, cold, with a taper mandrel, and being placed in a special machine, resembling a lathe, was rapidly revolved, while a former was, by special hydraulic machinery, pressed steadily and powerfully against the expanded end until the metal was heated, and spun into the general shape of a flange. It was necessary to cut only ⅛-inch from the edge of this flange to remove absolutely all indications of fraying or cracks, and then the flange end was trued up to give it the finished appearance shown in the upper piece in the figure.

A powerful machine is now under construction by which this character of work will be applied to pipes up to eight inches outside diameter, which includes all the sizes of steam and water pipe now used in torpedo boats and destroyers building for the government. A series of tests is now being made on these flanges, using high-grade nickel-steel bolts, to determine just what pressure the flanges will stand. The thickness of flang necessary for each size of piping will be practically determined, and each piece will be tested to rupture, to locate the weak points in the design.

THE Cleveland City Forge & Iron Co., of Cleveland, has been awarded the contract for the rudder frame for the battleship Maine, building at the Cramp yard. The forging will weigh 45,000 pounds. The Cleveland company has also secured the contract for the forged frame for the battleship Ohio, to be built at the Union Iron Works San Francisco. The weight of this piece will be 33,000 pounds.

THE *Railroad Gazette* reports the following orders for equipment: Buffalo, Rochester & Pittsburg, 5 locomotives; Ohio Central, 3 locomotives; Minneapolis & St. Louis, 12 locomotives; Kanawha & Michigan, 3 locomotives; Chesapeake & Ohio, 16 locomotives; Mobile & Ohio, 20 locomotives; other minor roads, 6 locomotives. The Rock Island is building 16 locomotives at its own shops at Chicago.

OPEN-HEARTH STEEL PRODUCTION IN 1898.

General Manager Swank has just collected for the American Iron and Steel Association the preliminary statistics of the production of open-hearth steel ingots and direct castings in the United States in1898. Estimating the production of a few steel casting plants yet to report, the statement is as follows and the complete figures are to appear in the annual report of the association:

The production of open-hearth steel in 1898 was 2,220,492 gross tons, against 1,608,671 tons in 1897, an increase of 611,821 tons, or over 38 per cent. The following table shows the production of open-hearth steel ingots and direct castings by States during the past four years, in gross tons:

States—Gross tons	1895.	1896.	1897.	1898.
New England	36,733	48 055	51,402	47,381
N. Y. and N. J.	32,203	33,130	39,521	47,957
Pennsylvania	504,352	1,009,608	1,271,731	1,817,521
Ohio	75,637	64 691	78,317	79,886
Illinois	49 500	101,831	120,609	173,103
Other States	38,757	42,394	47,031	54 644
Total	1,137,182	1,298,700	1,608,671	2,220,492

The open-hearth steel made in 1898 was produced by 65 works in 13 states—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Kentucky, Alabama, Ohio, Indiana, Illinois, Wisconsin, Missouri and California. Of the total production in 1898, 1,559 412 tons were made by the basic process and 661,080 tons by the acid process. In 1897 the production by the basic process amounted to 1,056,043 tons and by the acid process to 552,628 tons.

States—Gross Tons.	Basic open-hearth steel.	Acid open-hearth steel.	Total Gross tons.
New England	9,466	37,915	47,381
N. Y. and N. J.	13,074	34,933	47,957
Pennsylvania	1,321,308	495,213	1,817,521
Ohio	43 650	36,236	79,886
Illinois	141,891	29 212	173,103
Other States	28,071	26,571	54,644
Total	1,559,412	661,080	2,220,492

The total production of open-hearth direct steel castings in 1898 amounted to 110,787 gross tons, of which 18,460 tons were made by the basic process and 92,327 tons were made by the acid process. The following table gives the production of open-hearth steel castings by the acid and basic processes in 1898, by states.

States—Gross tons.	Acid castings.	Basic castings.	Total.
Mass., Conn., N. Y., and N. J.	14,657	.....	14,657
Pennsylvania	45,712	1,558	47,270
Ohio and Indiana	19,659	150	19 819
Illinois, Wis., Mo., and Cal.	12,289	16,752	29,041
Total	92,327	18,460	110,787

The total production of open-hearth steel ingots and castings has almost doubled since 1895, when the United States made 1,137,182 tons.

Record Broken at Duquesne Steel Works.

The Duquesne Steel Works plant of the Carnegie Steel Co., Ltd., broke all previous records for ingots and finished material on Monday, March 20th. The converting mill produced:

	Heats.	Tons of Ingots.
No. 1 turn	105	1,013
No. 2 turn	116	1,126
Total	221	2,139

The rolling mill produced:

	Heats.	Tons.
No. 1 turn	114	955
No. 2 turn	118½	1,032
Total	232½	1,987

The output consisted of 4 x 4, 1½ x 1½, 2 x 2-inch billets and splice bars. On Tuesday, March 21, the remarkable records of Monday were eclipsed in the converting mill, as appears from the following:

	Heats.	Tons.
No. 1 turn	119	1,143
No. 2 turn	118	1,125
Total	237	2,268

THE starting up of the old Phœnix Furnace of the Brown-Bonnell Iron Co., Youngstown, O., is under consideration.

A PIECE OF FINE MEDALLION WORK.

At the foundry of J. J. Ryan & Co., 68–74 West Monroe st., Chicago, of which views were shown recently in these columns, work has been completed on a beautiful medallion and series of panels in bronze, to be placed on a monument. The memorial is in honor of John A. Martin, a Kansas soldier and statesman, and is to be erected at Atchison, Kan. The medallion is in bronze, about 24 x 30 inches, and accompanying it is a series of panels portraying the various positions of trust occupied by Gen. Martin. He was colonel of the 8th Kansas Volunteers, brevet brigadier general of U. S. Volunteers; for many years editor and publisher of the Atchison *Champion*, and from 1885–1889 governor of Kansas. He died in Atchison in 1889.

IN MEMORY OF A SOLDIER AND STATESMAN
JOHN A. MARTIN
BORN AT BROWNSVILLE, PA. MARCH 10, 1833.
DIED AT ATCHISON, KAS. OCT. 2, 1889.
COLONEL OF THE 8TH KANSAS VOLUNTEERS, AND
BREVET BRIGADIER GENERAL OF U.S. VOLUNTEERS.
EDITOR & PUBLISHER OF THE ATCHISON CHAMPION
FROM 1858-1883. GOV. OF KANSAS FROM 1885-1889.
TO COMMEMORATE HIS PUBLIC & PRIVATE VIRTUES,
HIS FRIENDS HAVE ERECTED THIS MONUMENT.

The medallion, of which a photographic reproduction is given herewith, is pronounced a fine specimen of artistic foundry work, representative of a variety of lines which J. J. Ryan & Co. include in their extensive operations. Their plant is probably the largest jobbing brass foundry in the United States, and they are known as manufacturers of Babbitt metals and of all kinds of brass and bronze work used in shipbuilding.

Electric Power for Steel Works.

Since the advent of three and five-motor electric cranes, many other machines, even more flexible in their fields of operation, have been designed and built, largely for use in rolling mills. Such, for example, are the various types of charging and drawing machines, for placing ingots, slabs, and blooms in heating pits or furnaces, and for withdrawing them when heated; also machines for charging stock into melting furnaces, and for many other purposes, more or less special.

The greater part of the development in this field, however, has occurred in the last two, or possibly three years. In one of the largest steel plants, where between 7,000 and 8,000 h. p. of motors are in use, over one-half of that amount has been installed within the last eighteen months, and installation is still proceeding at the same rate.

Among incidental uses of electricity in rolling mills may be mentioned one which is deserving of far wider application than it receives—the use of electro-lifting magnets, for the handling of plates, bars and ingots. A plate is a most awkward piece of material to take from the top of a pile by the ordinary methods. It generally has to be pried up with a bar far enough to allow hooks, suspended from the crane block, to be placed under it, and when it has been placed in the required position the hooks must be removed. These operations require at least two men, and, if time be an object, four. How much simpler, quicker, and cheaper it is to lower a magnet down upon the center of the plate, close the switch to excite the magnet coils, transfer the plate to its required position and open the magnet circuit to release the plate!

The objection is often raised that it is dangerous to handle plates in this way, because the current may fail and allow the plate to drop on some one. In answer to this it may be said that a number of magnets have been in use in several large establishments for several years, and the first accident from this cause has yet to be reported. The saving of labor and time when a plate-handling crane is equipped with an electro-magnet is almost beyond credence.—[Eugene B. Clark, in Cassier's Magazine for April.

FOUNDRYMEN'S EXPERIENCE WITH ALUMINUM.

The experiences of brass founders in using aluminum in brass are as variable as the weather. While some founders report success by the addition of aluminum, others say that even a trace of aluminum spoils their castings. In view of these divergent opinions, it is interesting to note the experience of those founders who have a good word for aluminum.

Edward Zusi, one of the largest founders in Newark, says he would not be without aluminum. A great deal of Mr. Zusi's work is for the metal parts of harness trimmings, and in this work many patterns are run on one gate, and Mr. Zusi finds it a great advantage to use aluminum to give the brass greater fluidity. Another class of work in which this founder has found aluminum to work very satisfactorily is when he is pouring metal "on the flat." By utilizing aluminum, brass castings can be made "on the flat," while without it the flask would have to be put on end. It is Mr. Zusi's experience that the addition of the right proportion of aluminum to brass acts beneficially, except where the brass is to be dipped in acid. In dipped work aluminum does not work well.

Another Newark brass foundry which uses aluminum with success is that of Brabson Brothers. It is the practice of this firm not to put the aluminum into the brass until just before pouring. When the crucible is taken out of the furnace and the molten metal skimmed, a tiny piece of aluminum is dropped into the pot and thoroughly stirred in. By this means the firmgets the full effect of aluminum. The work of Brabson Brothers is chiefly in hardware specialties, and aluminum is used in the castings to make them sharper and of a firmer texture.

The reason that founders have experienced so much trouble in putting aluminum in their brass is that they put in too large a quantity of the metal. As has been explained in these columns, a piece as big as a pea in a pot of brass containing about 100 pounds of metal will affect the mixture beneficially. Every brass founder who makes a study of his business soon learns the exact quantities of metals with which he gets good results, and when once this is learned, and the exact proportion fixed, the founder should take pains to always use the correct amounts. In our last issue we spoke of the benefit derived by the Patton Manufacturing Co., of Columbus, O., in putting a quarter of 1 per cent in No. 3 government bronze. The best tensile strength of plain government bronze is 47,000 pounds per square inch, but by the addition of the slight per cent of aluminum the Patton company raised this strength up to the average of 53,000 pounds per square inch.

From the experience of the founders mentioned it would seem as if aluminum were a benefit to brass and bronze. At any rate, these founders are of the opinion that the foundrymen who did not get good results from aluminum for their brass are those who do not know how to use the metal. In any event, the quantity of aluminum put into the brass should be very minute, unless the brass founder thoroughly understands alumium and its alloys, and the effect it has on other metals. As we have frequently pointed out, the best way to introduce aluminum into the brass is in the form of aluminized zinc, the standard mixture for which is 10 per cent of aluminum and 90 per cent of zinc.—[Aluminum World.

Last week George Powell, president of the International Protective Tinworkers' Association, and T. F. Berry, treasurer, went to Chicago to confer with the American Tin Plate Co. relative to a recognition by the company of the association, and the establishment of uniform wages for the tinhouse employes in all the company's plants who belong to the union, which has only recently been formed. They state that the representatives of the company made a formal statement that the company was friendly to labor and to the interests they represented. The ground was carefully gone over and definite action suspended until after the convention which the association is to hold on the first Monday of May in Columbus, O., when a scale of wages is to be formulated, which will then be presented to the tin plate company for a conference.

At New London, Conn., Joseph Lathrop is erecting a machine shop for gas engine manufacture.

INCREASING PIG IRON PRODUCTION.

The current issue of the *Bulletin* of the American Iron and Steel Association gives the results of an inquiry into the prospects for an increase of pig iron production. The statistics of the association showed that on Dec. 31, 1898, there were in blast 202 furnaces with a weekly capacity of 247,500 gross tons. From this rate there was a slight decline in January and, owing to the extremely cold weather, a further decline in February. Meantime some furnaces blew in and others were blown out. The figures just collected show that 16 furnaces were blown out, with a weekly capacity of 10,740 tons, between Jan. 1 and March 10, and that 14 were blown in before March 10, having a weekly capacity of 10,121 tons. Of those reporting that they would blow in in March after the 10th (some of them are now in blast) or that they expected to go in at an early date, there were 48, having a weekly capacity of 39,972 tons. The coke and anthracite furnaces blown in since March 10, or to be blown in in April and May, are thus enumerated by the *Bulletin*, with their capacity. All are expected to become active, though in a few cases there is a contingency. The Allentown Rolling Mills stack is reported "uncertain." The Aurora Furnace "may" blow in and the same word is used concerning Steubenville furnace:

Furnaces.	Weekly Capacity. Gross Tons.
Poughkeepsie Furnace, N. Y., May,	800
Union Iron Works, New York, Spring,	1,500
Allentown Iron Co., Pa., April,	550
Allentown Rolling Mills, Pa., about May 1,	280
Carbon Iron & Steel Co., Pa., March 20,	700
Crumwold Furnace, Pa., April,	700
Durham Furnace, Pa., about May 1,	1,000
Thomas Iron Co., Pa., March, (three stacks),	1,400
New Keystone Furnace, Pa., April,	1,400
Sheridan Furnace, Pa., March 16,	425
Swede Furnace, Pa., May or June,	1,000
Aurora Furnace, Pa., May,	700
Lebanon Furnace Pa., July,	1,400
Paxton Furnace, Pa., April 1,	630
Carnegie Steel Co., Pa., one stack on ferro, April,	350
Alice Furnace, Pa., March 17,	1,300
Douglas Furnace, Pa., about May 1,	650
Ella Furnace, Pa., May,	600
Fannie Furnace, Pa., about May 1,	875
Sharon Furnace, Pa., about April 1,	1,050
Charlotte Furnace, Pa., April,	1,200
Alleghany Furnace, Va., April 10,	500
Ivanhoe Furnace, Va., about May 1,	360
Covington Furnace, Va., March,	900
Norton Furnace, Ky., May,	325
Watts Syndicate, Ky., March,	1,000
Embreville Furnace, Tenn., March,	700
Carolina Furnace, N. C., May,	700
Pioneer Furnace, Ala., about April 30,	1,000
Hubbard Furnace, Ohio, April 1,	1,700
New York Furnaces, Ohio, May 15, (2)	1,200
Lorain Steel Co., Ohio, one in May, one in June,	6,700
Mingo Furnace No. 2, Ohio, May,	1,600
Steubenville Furnace, Ohio, May,	1,155
Alice Furnace, Ohio, May,	1,400
Bay View Furnace, Wis., March,	1,155
Total,	38,905

The charcoal furnaces reported as expecting to resume are: Richmond Iron Works, Mass., April 1, 100 tons; Greenwood Furnace, Pa., April 1, 50 tons; Reed Island Furnace, Va., April 1, 40 tons; Cumberland Furnace, Tenn., June 1, 275 tons; Attalla Furnace, Ala., April 20, 250 tons; Alcalde Furnace, Texas, April, 180 tons; Bloom Furnace, Ohio, April, 72 tons; McGugin & Co., Ohio, 100 tons. Total 1,067 tons a week.

It will be readily apparent from the capacities of these furnaces that are now coming into line, that the activity of many of them is conditioned on high prices; also that with this production added to the current rate, the scale will be turned, putting the output about 100,000 tons a month beyond consumption, if the latter continued as in the last two months. How much of a decline in price would be required to restore the equilibrium by causing the retirement of a portion of this capacity is a question that cannot be answered in advance. Once started and sales made for some months ahead, all might run through the year, at least.

It is reported that a combination is being agitated to embrace the manufacturers of hoops and cotton ties.

Wire Gauges.—II.*

(CONCLUDED.)

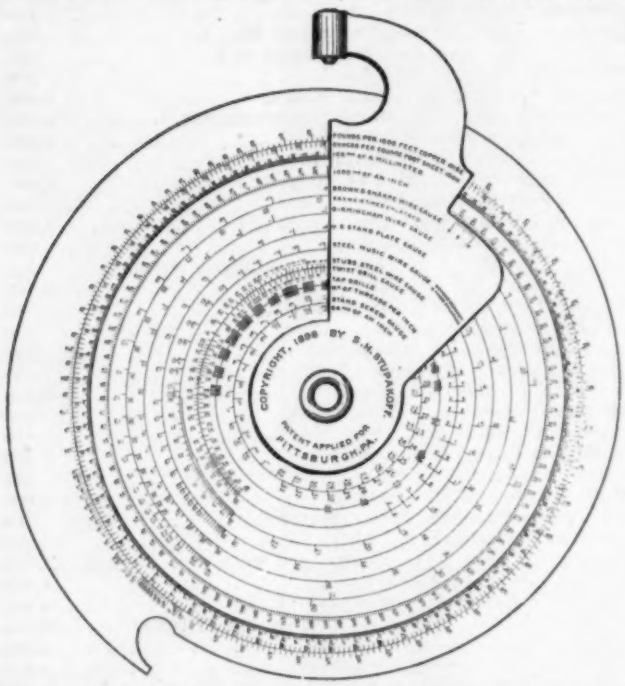
BY S. H. STUPAKOFF.

I believe that, at least to some extent, I have succeeded in solving this problem by means of an instrument which I have now the pleasure of exhibiting for the first time and before this society. I have named it

The Comparometer.

Questions such as just cited repeat themselves daily, and it occurs to me quite frequently that I have to answer questions of this nature. For instance, I was asked quite recently: "What is the weight of 3 x 4 inches of No. 31 platinum?" Who can answer such a question off-hand? We all know a cubic foot of iron weighs about 480 lbs., and perhaps we may remember a cubic foot of copper weighs 555 lbs., besides knowing the weights of two or three other substances. And how long would it take you to solve this little problem? You can give a correct answer perhaps in ten or fifteen minutes if you find the necessary data, while it did not take me a minute with the aid of this little instrument, as I will explain to you presently.

Constantly recurring questions of this nature prompted me to think over this matter, with the intention of placing in the hands of foremen and storekeepers something which would enable them to answer such questions themselves. I commenced by tabulating such standards as are in everyday use



by most of the skilful mechanics and instrument makers, and especially by those connected with electrical engineering. Acquainted with the requirements in ordinary machine shop practice, this did not prove to be a difficult task. They were easily collected from about a dozen hand-books and trade catalogues, which are so liberally studded with useful information. From this compilation the best known and the most practical ones were selected, and a few others added which, though not in general use are likely to gain a solid footing in the metal trades in the next few years. Adding to these a few tables of weights of materials, my completed list footed up as follows:

Brown & Sharpe, or American Wire Gauge.
Birmingham Wire Gauge.
United States Standard Gauge for Plates.
Steel Music Wire Gauge.
Stubs' Steel Wire Gauge.
Morse Twist Drill Gauge.
American Standard Screw Gauge.
Number of threads per inch of American standard machine screws.
List of Tap Drills for American standard machine screws.
Scale of 64ths of an inch.
Scale of 100ths of an inch.
Scale of 100ths of a millimeter.
Scale of weights of copper wire.
Scale of weights for sheet iron.

There is no doubt that with the aid of these tables nearly all questions can be answered which arise in the mechanic's everyday practice. It is true, there may be a few tables missing to make this list complete, but those not mentioned represent the requirements of special branches of the engineering professions. At all events, the above compilations cover the ground fairly well, and certainly much better than anything that has heretofore been attempted.

But it should be remembered that the mere collection of such tables would not meet the requirements of practical men. They can be found scattered in numerous handbooks, and as such they serve as reference only. In practice it is necessary that they should be arranged in such a manner that they can be compared with each other at a glance and without necessitating complicated calculations. If any, there are only a few exceptional cases where a man is able to form in his mind an idea of dimensions if they are given in figures only. And we may safely say, nobody can determine without instruments the relation which exists between the various numbers of our current gauges and their corresponding dimensions expressed in decimal parts of an inch or in millimeters.

This process requires a difficult mental transformation of a mathematical value into a property of an object which can be grasped with the eye. The only solution of the problem to facilitate the reading of the numerous gauges, to obtain a better understanding of their relations, and to educate the mechanic to the use of the metric system is a mechanical device which can be conveniently handled and which is easily understood by all workmen of ordinary intelligence.

With this point in view and with the object before him, the writer started out to find the necessary means to accomplish the task. It would be tiresome to describe the numerous schemes which had to pass a critical review before one of them was finally selected, although it might be interesting and instructive for many readers who pass their time with improving old or constructing new devices, to hear the history of the gradual development of this little instrument. It would easily convince them that it is not sufficient to draw a few lines on paper and call the thing done. The real trial begins only after a new idea has been mapped out. A new device may be excellent for its purpose, but the main point to be settled in such a case is, Is it commercially practical? Therefore, the manufacture of the article has to be taken into consideration. Many new methods must be employed and numerous new devices must be constructed to produce the article itself.

This was identically the case with the present instrument, the final form of which is illustrated in Fig. 1. It justly deserves its name "Comparometer" as it is intended for comparing different standards, though incidentally it serves well for determining standard dimensions, numbers of standard gauges and various co-related properties of objects depending upon their dimensions.

Details of Construction.

The comparometer combines a micrometer caliper, of English and metric division, with various current gauges for wire, plate, drills, etc.; it gives the weights for round and sheet metals, the number of threads per inch for standard machine screws and suitable tap-drills therefor, and it furnishes the means for comparing any or all of these data at a glance. The mechanical principle involved in the comparometer is that of a plane spiral base combined with a radius vector, movable around its pole. A shifting of the radius vector causes some fixed point on it to recede from or to advance toward the spiral. The rate of recession or advancement is in direct proportion to the arc traversed.

The pitch of the spiral in this instrument is one-half inch, and the space between the circumference of the base and the adjusting screw of the radius vector or indicator arm gives an equivalent range of measurement. The readings corresponding to the absolute measurements of the comparometer caliper are tabulated on the base, and they are found, in each instance, in a radial line with the micrometer screw along the beveled edge of the indicator arm. The latter bears the

* Read before the German Engineers' Society, Pittsburg, Pa., March, 22, 1899.

descriptions for the divisions on the base and a vernier for the inch scale. The indicator arm is equipped with an adjusting screw in the same plane with the spiral edge of the base, and at right angle to its tangent.

The divisions on the base are described on the indicator; they represent in all cases a limit between 0 and ½ inch for the whole revolution. All numbers relating to the divisions on the base are marked above their respective division lines, which facilitates their reading without shifting the indicator. The inch circle being divided into 500 equal parts, represents five hundred one-thousandths, or each of its divisions one one-thousandth of an inch. Intermediate divisions can be read off with ease on the vernier belonging to this circle; with its aid direct readings to one ten-thousandth of an inch can be obtained. The metric circle gives direct readings from 0 to 12.7 millimeters in hundredths of a millimeter.

The Brown & Sharpe wire gauge circle is provided with double divisions. The divisions on the outside of the circle are in direct proportion to the inch and the metric circle. The divisions on the inside, however, are tenfold enlargements of the former; they add, therefore, another decimal to the inch and metric scales, when compared therewith. For instance: No. 40 B. & S. wire gauge on the outside of the third circle is read with the aid of the indicator .003 inch on the inch circle, and the vernier gives an additional reading of .0001. The same number wire gauge on the inside of the circle is read on the inch circle .0031, while the vernier gives an additional figure, .00004. These finer readings, however, being only important for the smallest sizes of wires, do not run beyond the limit of .05 inch.

The steel music wire gauge, representing numbers from 8-0 to 30, and ranging in size from .0083 to .080 inch, is located on the fourth smallest circle. Its readings on the first portion of the circle, which are connected by a bracket, can be directly compared with any of the other gauges or scales on the dial. The reading on the inch circle, compared therewith, will give, therefore, dimensions in three decimal places, the fourth one being found with the aid of the vernier. But if comparison with other gauges is not required, it will be found more convenient to make use of the 10 times enlarged divisions, which are located on the second portion of the same circle beyond the bracket; in this case, readings on the inch circle will indicate four decimal places, and the vernier will not be required.

The Stubs steel wire and the Twist Drill gauges, being nearly alike, are marked on one common circle, the one outside and the other inside of the same. The gauge lines and numbers of the American standard screw gauge are placed on the outside of the smallest circle; their corresponding dimensions or diameters are found radially in line therewith on either one of the scale circles; the number of threads to the inch and number of tap drills occupy the space on both sides of the second smallest circle. This gives all information necessary relating to American standard machine screws.

The division on the inside of the smallest circle gives relative values of the above dimensions in 64ths of an inch. The division on the outside of the largest circle gives the weight of 1,000 feet of copper wire in pounds avoirdupois, and the division on the inside of the same circle gives the weight in ounces for each square foot of sheet iron. (Copper of 8 89 spec. grav. weighing nearly 555 pounds per cubic foot, iron of 7.69 spec. grav. weighing 480 pounds per cubic foot; water at its greatest density being 62.425 pounds per cubic foot.)

It is not difficult to see what use can be made of this instrument. In the first place, it replaces all gauges which are marked on its face; then, as a micrometer caliper, it combines with either one or all of these gauges an accurate measuring instrument with divisions of 1000ths of an inch, 64ths of an inch, and 100ths of a millimeter, and, finally, it gives in addition valuable information which is frequently sought for. In fact, it is a veritable library for the mechanic. It will answer a dozen different questions in a single setting, and these answers are always reliable. It does not require any skill for handling, as any ordinarily intelligent man can read it, even without explanation, it will give closer readings than usually required in practice, and it does away with calculating in the shop.

A single example will sufficiently explain its working. Let us assume we have a piece of copper wire, of which we would like to find out all possible data. We bring it bewteen the spiral edge of the instrument and the micrometer screw and, looking along the straight edge of the indicator for the number of wire gauge, we find it to correspond exactly to

No. 4 B. & S. wire gauge.

Radially in line therewith and beginning nearest the center we find further the equivalents for this number in the following order:

13-64 inch,
No. 11 Standard Machine Screw,
24, 28, or 30 threads per inch,
No. 21, 20, or 19 Tap Drill,
No. 26 Twist Drill Gauge,
No. 5 Stubs' Steel Wire Gauge,
No 6 B. Wire Gauge,
.2043 inch,
5.19 millimeters,
Equals 126½ lbs. per 1,000 ft. (copper wire).

I have selected this example as it is illustrated in the figure before you; and you will be able to follow the answers if the figures in the reduced print are sufficiently distinct. You will understand that the fourth decimal of the equivalent in decimal parts of an inch is to be found with the vernier at the upper right hand of the indicator.

Now I owe you an explanation as to how I determined, with this instrument, the weight of the piece of No. 31 sheet platinum, which I mentioned at the beginning of the paper. I used for this purpose a table of constants, which represent the specific weights of various substances having as base or unit iron and respectively copper. If it is a piece of sheet metal of which it is desired to know the weight I find the weight of a square foot of sheet iron with the instrument and multiply this by the constant (here 2.796 for platinum, iron being 1). If it should be wire, or round rod, I multiply by the constant given under copper = 1; then I reduce the product to the fraction of a square foot, or of 1,000 ft. wire, as required.

The absolute weights of substances are easily calculated with the aid of suitable multipliers representing their specific weights as compared with another substance serving as unit. The specific weights are found by dividing the specific gravity of the various substances by the specific gravity of the substance serving as unit. Taking the weights of wrought iron and copper as 1, the specific weight of various commercial metals is as follows:

TABLE I.

Symbol.	Metal.	Specific Gravity.	Specific Weight.		Weight per Cubic Foot.	Weight per Cubic Inch.	Weight per Ft. ¼ Inch Thick.
			Fe.=1.	Cu.=1.			
Al.	Aluminum, wr'ght..	2.67	.348	.3003	167	.097	3.48
Sb.	Antimony.....	6.71	.879	.7546	418	.242	8.79
Bi.	Bismuth	9.90	1.285	1.1246	617	.357	12.85
Bs.	Brass, wire (70 Cu. 30 Zn.)..	8.558	1.1117	.9625	533.6	.3088	11.117
Bz.	Bronze, bearing (79 Cu. 21 Sn.).....	8.73	1.133	.9818	544	.315	11.33
Cu.	Copper, wire.....	8.8917	1.155	1.000	554.4	.3208	11.55
Au.	Gold..	19.24	2.500	2.1638	1,200	.694	25.00
Fe.	Iron, wrought	7.696	1.000	.8658	480	.2778	10.00
FeC.	Cast iron.....	7.217	.9375	.8117	450	.2604	9.375
Pb.	Lead, sheet	11.356	1.475	1.2771	708	.4097	14.75
Hg.	Mercury	13.60	1.769	1.5273	849	.491	17.69
Ni.	Nickel, hammered..	8.67	1.127	.9638	541	.313	11.27
Pt.	Platinum	21.52	2.796	2.4202	1,342	.777	27.96
Ag.	Silver	10.50	1.365	1.1809	655	.379	13.65
St.	Steel	7.858	1.0208	.8837	490	.2836	10.208
Sn.	Tin	7.41	.962	.8334	462	.268	9.62
Zn.	Zinc, sheet.....	7.20	.935	.8097	449	.260	9.35

It will be noticed that symbols have been prefixed in the above table to the various composite metals. Though it is not customary to apply such in general, they are suggested for use as being descriptive and at the same time convenient for use in practice.

You will note a peculiarity in the above table by comparing the figures given in the columns under the head of specific weight, wrought iron being 1, and the weight of one square foot of metal ¼ inch thick. The latter is exactly 10 times the amount of the value given as the specific weight.

While in the foregoing I have explained the exact manner in which I proceeded in this particular instance, to obtain the weight of a piece of metal of a certain thickness and of certain dimensions, which was not to be found on the notations of the comparometer, I now deviate somewhat from the practice followed at that time. I have since provided the rear of

the base with additional divisions, representing data especially relating to the weights of various commercial metals. The indicator extends in this case over both faces of the base, and the weights for any metal which may not be marked on its face, relating to dimensions on the front, are found at their respective places in the rear.

This, of course, avoids all calculations of the nature explained in connection with the piece of sheet platinum

I must refrain from entering here into a detailed description of the various modifications which this instrument is adapted for, and I will reserve this until some future opportunity, when with your kind permission I will bring this matter again before you. But before retiring I will touch on one chapter which is intimately related to the above subject, and which deals with the introduction of

The Metric System

of measurements into our ordinary shop practice. You all know that this question has caused a great deal of thought, discussion and controversy.

Much has been said in favor of the system and many arguments have been brought against its adoption. However, it appears that the difficulty encountered was caused chiefly by not providing an easy method for leading this innovation into our manufacturing establishments. This subject is a very broad one, and therefore I will touch only such points as are within the scope of to-night's paper by illuminating some phases which may have escaped the general notice.

Let us look over the large list of wire gauges and see if any one of these would be suitable for use in connection with the metric system.

We should begin by throwing aside all those, the divisions of which advance in irregular steps. Then we have only three left to choose from, namely, the B & S., the United States Standard plate, and the Whitworth wire gauge. And of these three, there is really only one, the B. & S. gauge, in which the consecutive numbers progress uniformly. But of the remaining two, the United States Standard plate gauge represents some peculiarities which suit our purpose remarkably well. It is true, the dimensions of this gauge give no even numbers in our customary common fractions, neither is it possible to express the same accurately in thousandths of an inch; yet they are all multiples of $\frac{1}{2560}$ of an inch, and with the exception of Nos. 32, 34, 36 and 37 they are multiples of $\frac{1}{640}$ of an inch. But in order to give their approximate equivalent thickness in decimal parts of an inch it will be necessary to use as many as 10 decimal places.

By comparing the above mentioned fraction, $\frac{1}{2560}$ inch, with the value of $\frac{1}{100}$ of a millimeter in inches, $\frac{1}{2540}$, it will be observed that there exists between the two only a very slight difference, amounting to about .08 per cent; and, therefore, if the dimensions of the various numbers of this gauge were to be expressed in hundredths of a millimeter, this 8-10 per cent difference would never be exceeded. This brings us within the limit of the law of March 3, 1893, Section 3, of which reads: "That in the practical use and application of the standard gauge hereby established a variation of 2½ per cent either way may be allowed." Moreover, in thus giving the dimensions for the various numbers of the United States Standard gauge for plates in hundredths of a millimeter, there would not be a single instance in which the variation by actual measurement would exceed 5-1000 of a millimeter, or .0001968 of an inch.

The Element of Weight.

In the foregoing explanation it has been taken for granted that one cubic foot of iron weighs 480 lbs., which equals a specific gravity of 7.698. But it is a fact that, with the exception of a few brands (Yorkshire bar and Lowmoor plates), the specific gravity of commercial iron always runs below 7.7; namely, from 7.53 to 7 60, and accordingly the weight per cubic foot from 469.5 to 474 lbs. Kirkaldy gives the mean specific gravity of iron at 7.65 and the weight per cubic foot at 477 lbs. This latter figure brings the weight of the iron remarkably close to 476.25 lbs. per cubic foot, which, if adopted as the standard weight of the cubic foot, would make it possible to express the dimensions of the United States Standard plate gauge correctly in even multiples of 1-100 of a millimeter, providing the weight per square foot of sheet iron were laid down as the basis for their dimensions. Why this should be the case is easily to be seen from the following:

If one cubic foot of iron weighs 476.25 lbs., one square foot 1 inch thick will weigh $\frac{476.25}{12}$ lbs., or $\frac{476.25}{12}$ by 16 equals 635 ounces. This value can be divided into 2,540 evenly, the quotient being 4. And as 1 inch equals 25.4 millimeters, or 2,540 hundredths of a millimeter, one square foot of iron weighing one ounce would be .04 millimeter in thickness, or one square foot of iron one millimeter thick would weigh exactly 25 ounces. Therefore, leaving the given weights for the various numbers of the United States Standard plate gauge as a basis for the calculations, all corresponding thicknesses can be expressed in even hundredths of a millimeter, and in this manner we arrive at a simple method to aid in the introduction of the metric system into our ordinary shop practice. A comparison of the figures in the following table will substantiate the above:

II.

UNITED STATES STANDARD GAUGE FOR SHEET AND PLATE IRON AND STEEL.

Number of Gauge.	Iron Weighing 480 Lbs. per Cubic Foot. Approximate Thickness in— Fractions of an Inch.	Decimal Parts of an Inch.	Decimal Parts of a Millimeter.	Hundredths of a Millimeter.	Weight per Square Foot. In Ounces, Avoirdupois.	Pounds, Avoirdupois.	Iron Weighing 476¼ Lbs. per Cubic Foot. Approximate Thickness. Decimal parts of an Inch.	Thickness in— Decimal Parts of an Inch.	Hundredths of a Millimeter.	Number of Gauge.
				1						
7-0	½	.5	12.7	12.7	320	20.	.5039	.503936	12.8	7-0
6-0	15-32	.46875	11.90625	11.91	300	18.75	.4724	.47244	12.	6-0
5-0	7-16	.4375	11.1125	11.11	280	17.50	.4409	.440944	11.2	5-0
4-0	13-32	.40625	10.31875	0.32	260	16.25	.4094	.409448	10.4	4-0
3-0	⅜	.375	9.525	9.53	240	15.	.3780	.377952	9.6	3-0
2-0	11-32	.34375	8.7363	8.74	220	13.75	.3564	.356356	8.8	2-0
0	5-16	.3125	7.9375	7.94	200	12.50	.3150	.31496	8.	0
1	9-32	.28125	7.1437	7.14	180	11.25	.2835	.283464	7.2	1
2	17-64	.265625	6.744335	6.74	170	10.625	.2677	.267716	6.8	2
3	¼	.25	6.35	6.35	160	10.	.2520	.251968	6.4	3
4	15-64	.234375	5.953125	5.95	150	9.375	.2992	.23622	6.	4
5	7-32	.21875	5.55625	5.56	140	8.75	.2205	.220472	5.6	5
6	13-64	.203125	5 159375	5.16	130	8 125	.2047	.204724	5.2	6
7	3-16	.1875	4.7625	4.76	120	7.5	.1890	.188976	4.8	7
8	11-64	.171875	4.365625	4.37	110	6.875	.1732	.173228	4.4	8
9	5-32	.15625	3.96875	3.97	100	6.25	.1575	.15748	4.	9
10	9-64	.140625	3.571875	3.57	90	5.625	.1416	.141732	3.6	10
11	⅛	.125	3.175	3.18	80	5.	.1260	.125984	3.2	11
12	7-64	.109375	2 77812	2.78	70	4.375	.1102	.110236	2.8	12
13	3-32	.09375	2.38125	2.38	60	3.75	.0945	.094488	2.4	13
14	5-64	.078125	1.984375	1.98	50	3.125	.0787	.07874	2.	14
15	9-128	.070312 5	1.7859375	1.79	45	2.8125	.0709	.070866	1.8	15
16	1-16	.0625	1.5875	1.59	40	2.5	.0630	.062992	1.6	16
17	3-160	.05625	1.42875	1.43	36	2.25	.0567	.0566928	1.44	17
18	1-20	.05	1.27	1.27	32	2.	.0504	.0503936	1.28	18
19	7-160	.04375	1.11125	1.11	28	1.75	.0441	.0440944	1.12	19
20	3-80	.0375	.9525	.95	24	1.50	.0378	.0377952	.96	20
21	11-320	.034375	.87363	.87	22	1.375	.0356	.0 56356	.88	21
22	1-32	.03125	.79375	.79	20	1.25	.0315	.031496	.8	22
23	9-320	.028125	.71437	.71	18	1.125	.0283	.0283464	.72	23
24	1-40	.025	.635	.64	16	1.	.0252	.0251968	.64	24
25	7-320	.021875	.555625	.56	14	.875	.0220	.0220472	.56	25
26	3-160	.01875	.47625	.48	12	.75	.0189	.0188976	.48	26
27	11 640	.0171875	.4365625	.44	11	.6875	.0173	.0173228	.44	27
28	1-64	.015625	.396875	.4	10	.625	.0157	.015748	.4	28
29	9-640	.0140625	.3571875	.38	9	.5625	.0142	.0141732	.36	29
30	1-80	.0125	.3175	.32	8	.5	.0126	.0125984	.32	30
31	7-640	.0109375	.277812	.28	7	.4375	.0110	.0110236	.28	31
32	13-1280	.01015625	.25796875	.26	6½	.40625	.0102	.0102362	.26	32
33	3-320	.009375	.238125	.24	6	.375	.0094	.0094488	.24	33
34	11-1280	.00859375	.21829025	.22	5½	.34375	.0087	.0086614	.22	34
35	5-640	.0078125	.1984375	.2	5	.3125	.0079	.007874	.2	35
36	9-1280	.00703125	.17859 75	.18	4½	.28125	.0071	.0070866	.18	36
37	17-2560	.006640625	.16815435	.17	4¼	.265625	.0067	.0066929	.17	37
38	1-160	.00625	.15875	.16	4	.25	.0063	.0062992	.16	38

Avoirdupois and Metric Weights.

Upon further investigation we find in this table the most remarkable coincidence between avoirdupois and metric weights. That is, if we were to express the weights, which are given in ounces per square foot of sheet iron (weighing 476.25 lbs. per cubic foot) in grammes per square foot of aluminum, weighing 168 lbs. per cubic foot, we would obtain 10 grammes of aluminum for each ounce given for iron.

The thickness of the gauge expressed in metric measurement would therefore indicate for each 1-100 millimeter a sheet of aluminum 1 foot square equivalent in weight to 2.5 grammes. Hence, a sheet of aluminum No. 9 United States Standard gauge measuring 4 millimeters in thickness would weigh 1 kilogram. The slight error occurring in the above is of no practical consequence and can be safely neglected. It amounts to a little more than 1-10 a milligram (.113 mgr.) for 1-100 of a millimeter, which equals 45.3 milligrams or .689 of a grain in a sheet 1 foot square 4 millimeters thick.

It will be observed that the weights given in ounces for sheet iron express an equivalent in grammes for aluminum if multiplied by 10. No. 7-0 of the same gauge, measuring 12.8 millimeter would represent a sheet of aluminum 1 foot square weighing 3.200 kg. Even in this largest number of the gauge the above mentioned error amounts to only .14464 grammes, or practically 2 grains. This small difference represents a variation in the thickness of this plate of less than 1-100 of a millimeter or 36-10.000 inches or in all instances .00452 per cent, which is equal to an error of 1 in 22124.

With reference to the above it should be taken into consideration that the given weights per square foot of certain thicknesses are only approximate. While the specific gravity of sheet iron varies as quoted from 7.53 to 7.7, that of aluminum varies likewise. In rare instances only will material be found to correspond exactly to the above figures, and, naturally, in such a case the given weights are not absolutely

III.

UNITED STATES STANDARD GAUGE FOR SHEET AND PLATE IRON AND STEEL.

Adapted for English and Metric Weights and Measures.

Number of Gauge.	Approximate Thickness in Fractions of an Inch.	Weight of Iron per Ft.² in Kilogrammes.	Iron Weighing 476¾ Lbs. per Cubic Foot.		Thickness in 100ths of a Mm.	Aluminum Weighing 168 Lbs. per Cubic Foot.		Approximate Thickness in Decimal Parts of an Inch.	Number of Gauge.
			Weight per Ft² in Lbs.	Weight per Ft² in Ozs.		Weight per Ft² in Kilogrammes.	Weight per M² in Kilogrammes.		
7-0	½	9.07184	20.	320	12.8	3.200	34.445184	.5039	7-0
6-0	15-32	8.50485	18.75	300	12.	3.	32.29236	.4724	6-0
5-0	7-16	7.93786	17.50	280	11.2	2.800	30.139536	.4409	5-0
4-0	13-32	6.37087	16.25	260	10.4	2.600	27.986712	.4094	4-0
3-0	⅜	6.80388	15.	240	9.6	2.400	25.833888	.3780	3-0
2-0	11-32	6.23689	13.75	220	8.8	2.200	23.681064	.3564	2-0
0	5-16	5 6689	12.50	200	8.	2.	21.52824	.3150	0
1	9-32	5.10291	11.25	180	7.2	1.800	19.375416	.2835	1
2	17-64	4.819325	10.625	170	6.8	1.700	18.299004	.2677	2
3	¼	4.53592	10.	160	6.4	1.600	17.222592	.2520	3
4	15-64	4.252425	9.375	150	6.	1.500	16.146181	.2362	4
5	7-32	3.96893	8.75	140	5.6	1.400	15.069768	.2205	5
6	13-64	3.685435	8.125	130	5.2	1.300	13.993356	.2047	6
7	3-16	3.40194	7.5	120	4.8	1.200	12.916944	.1890	7
8	11-64	3.118445	6.875	110	4.4	1.100	11.840532	.1732	8
9	5-32	2.83495	6.25	100	4.	1.	10.76412	.1575	9
10	9 64	2.551455	5.625	90	3.6	.900	9.687708	.1417	10
11	1/8	2.26796	5.	80	3.2	.800	8.611296	.1260	11
12	7-64	1.984465	4.375	70	2.8	.700	7.534884	.1102	12
13	3-32	1.70 97	3.75	60	2.4	.600	6.458472	.0945	13
14	5-64	1.417475	3.125	50	2.	.500	5.38206	.0787	14
15	9-128	1.2757275	2.8125	45	1.8	.450	4.843854	.0709	15
16	1-16	1.13398	2.5	40	1.6	.400	4.305648	.0630	16
17	69-160	1.020582	2.25	36	1.44	.360	3.8750832	.0567	17
18	1-20	.907184	2.	32	1.28	.320	3.4445184	.0504	18
19	7-160	.793786	1.75	28	1.12	.280	3.0139536	.0441	19
20	3-80	.680388	1.50	24	.96	.240	2.5833888	.0378	20
21	11-320	.623689	1.375	22	.88	.220	2.3681064	.0356	21
22	1-32	.56699	1.25	20	.8	.200	2.152824	.0315	22
23	9 320	.510291	1.125	18	.72	.180	1.9375416	.0283	23
24	1-40	.453592	1.	16	.64	.160	1.7222592	.0252	24
25	7-320	.396893	.875	14	.56	.140	1.5069768	.0220	25
26	3-160	.340194	.75	12	.48	.120	1.2916944	.0189	26
27	11-640	.3118445	.6875	11	.44	.110	1.1840532	.0173	27
28	1-64	.283495	.625	10	.4	.100	1.076412	.0157	28
29	9-640	.2551455	.5625	9	.38	.090	.9687708	.0142	29
30	1-80	.226796	.5	8	.32	.080	.8611296	.0126	30
31	7-640	.1984465	.4375	7	.28	.070	.7534884	.0110	31
32	13-1280	.18427175	.40625	6½	.26	.065	.6996678	.0102	32
33	3-320	.170097	.375	6	.24	.060	.6458472	.0094	33
34	11-1280	.15592225	.34375	5½	.22	.055	.5920266	.0087	34
35	5-640	.1417475	.3125	5	.2	.050	.538206	.0079	35
36	9-1280	.12757275	.28125	4½	.18	.045	.4843854	.0071	36
37	17-2560	.120885375	.265625	4¼	.17	.0425	.452631246	.0067	37
38	1-160	.113398	.25	4	.16	.040	.4305648	.0063	38

reliable. Therefore it should be understood that the assumed standard weights per cubic foot of iron and aluminum serve only as a means to establish a gauge which accommodates itself to the English and metric system of weights and measures alike. The preceding table is compiled for this purpose from the United States Standard gauge for plates.

It is well worth while to note in connection with the American Standard screw gauge that we have adopted herewith, unconsciously, a standard which is in closer touch with the metrical system than any system ever proposed. The various consecutive sizes advance practically one-third of a millimeter. The difference is so small that, assuming No. 26=4-10 inch to be the base, the smallest number would vary only 10276-10,000,000, or a shade more than 1-1,000 of an inch from the size given in the list, while No. 50 would show up a difference of 8708-10,000,000, or somewhat less than one one thousandth of an inch of its actual size. And here is the explanation for it: 1-3 of a millimeter is equal to .0131233 inch, while the difference for consecutive sizes of the American Standard screw gauge is given at .01316 inch, and consequently there is a variation between both of only .0000367 inch.

An easy way to form an idea of the approximate diameter of American Standard screw gauge numbers without reference to tables is to remember that No. 26 is equal to 4-10 inch or .400 inch. Deduct therefrom (or add, as the case may be) the number required and multiply one-third of the difference by 40 (one millimeter equals .03937 inch), the product of which deducted from or added to 400 will give the diameter in one-thousandths of an inch.

Example:

No. 26 A. S. screw gauge = .400 inch.
No. 11
—
difference = 15
⅓ — 5 and .5 × .40 = .200

Diameter of No. 11 — .200 inch.

I hope that I have succeeded in demonstrating to you in the foregoing that there is a way out of the difficulty of introducing the metric system into our workshops. If the beginning is made here, the natural result will be its general spread over the whole country. If theory and practice combine their efforts, there is no doubt the day is not very distant when it will be universally adopted.

INDUSTRIAL IMPERIALISM.

Thomas Hitchcock contributes an article to the April Cassier's on some effects of the consolidation regime in industry. We make the following extract: It is said that the result of mammoth industrial combinations is to extort from consumers of their products higher prices, and, consequently, to secure for their owners excessive profits. This is not true as a matter of fact, any more than it is true that the weaving of cotton cloth in mills, instead of having it woven by hand on a small scale, renders it more costly to the consumer and unduly profitable to the mill owner. As the individual weaver by hand turns out less cloth by his day's work than the same weaver does in a mill, so a number of single mills produce less by the same expenditure of time and labor when run separately than when they are run in a combination. Instead of paying several sets of salaries, the combination pays but one; instead of forcing up by competition the cost of raw material, it buys it at the natural price, and, what is more, a smaller percentage of profits on the capital invested contents its members.

The last-mentioned item is one to which sufficient consideration is rarely given by even those who are friendly to the consolidation of industries now going on. The individual factory owner is, by common consent, entitled, as compensation for his enterprise and risk, to a sum which yields him on his investments a rate of interest far exceeding that which is paid to the idle capitalist, who relies for his income on the labor and enterprise of those to whom he lends his money. If, now, the factory owner can join to his own capital ten or a hundred times as much more, which other people are willing to lend him even at 5 and 6 per cent, he can do business at a vastly smaller rate of profit on the entire amount employed, pay 5 or 6 per cent on the portion he borrows, and still retain for himself the 20, 30 or 50 per cent on his own capital which he formerly gained. This is what the modern gigantic industrial combinations accomplish. The managers of them earn for themselves, indeed, princely salaries; but since they pay on the capital they employ only 5 or 6 per cent, they can afford to conduct the business at a vastly cheaper rate, and sell their product at a lower price, than if they had only their own capital to work with. Their subordinates, too, who formerly were independent factory owners, being relieved of personal risk and responsibility, are content with a correspondingly reduced compensation and this constitutes another saving of expense.

Respecting the supposed danger that these mammoth corporations may stifle competition, and exact from the community prices exceeding those which would be paid but for their formation it is sufficient to say that the increasing wealth of a country and the prevailing low rates of interest for money, which threaten to fall lower still, are a sufficient guarantee against it. There are among us too many able men seeking employment, and too many owners of capital ready to lend it to them, for a permanent monopoly to be established in any branch of industry. Great as is the power wielded by corporations with great capitals, it is not greater than the power that can be brought against them whenever they overstep the limits of moderation. Competition can be suppressed only by making it hopelessly unprofitable, and the knowledge of this fact is a sure protection of the community against any ill effects of industrial imperialism.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Vulcanus Forging Co., of Cleveland, has been incorporated, with a capital of $20,000. Incorporators are Alfred G. Hathaway, Arthur Scott, Jacob Weintz, C. K. Dissette and Otto Brinker.

At Cincinnati, bids are asked until April 12 for furnishing for the year ending April 30, 1900, machine shop castings in loam and green sand, furnaces, grates and linings, street valves and boxes, iron pipe and pipe specials, brass castings, brass ferrules, etc. G. H. Spellmire is clerk.

The United States Steel Castings Co., at Chicago, capital stock $400,000, has been incorporated by C. F. Springer, Albert H. Putney, Percival Steele.

New Construction:—

The Brightman Mfg. Co., Millersburg, O., has just erected an addition to its plant, covering 24,000 square feet of flooring, and will soon install a large amount of machinery of its own make and design, for the manufacture of shafting. It is probable that in the early summer another addition covering 8,000 square feet will be built. The company is well filled with orders, both for domestic and foreign shipment.

A new skelp mill is to be erected by the Wheeling Steel & Iron Co.

Plans for the new shops of the Union Malleable Iron Co., East Moline, Ill., were completed last week. The area of the plant is 522 x 900 feet and the foundry will be 408 x 150 feet.

Fires and Accidents:—

Fire starting in the japanning department of the Dangler Stove & Mfg. Co.'s plant, Cleveland, March 24, destroyed nearly all the establishment, with loss of $300,000, partly insured. The Cleveland Machine Screw Co.'s stamping works adjoining were also destroyed, with $150,000 loss.

Power Equipment and Machine Tools.

The Case Mfg. Co., Columbus, O., has just shipped a 15-ton electric traveling crane to St. Petersburg, for use at a port in some other part of Russia. Two 30-ton three-motor electric traveling cranes for use in the Government power station at Sydney, Australia, have also lately been sent by the same concern. Orders from Russia for all sorts of improved tools are said to be coming constantly to the New York exporting offices. The majority of these are, however, through German accounts. The last mail from Hamburg brought to a manufacturing firm with local offices on Liberty st. an order for what they claim will constitute two carloads of machine tools for engine works.

W. W. Shilling, general sales agent of the Wheeler Boiler Co., Sharon, Pa., has a contract for two 300 h. p. furnace boilers for the New York stacks at Shawneetown, O., which Miller, Wagoner, Fieser & Co. are putting in blast.

The Westinghouse Air Brake Works, at Wilmerding, Pa., will hereafter use electric motors in their works. The main power will be supplied by a turbine motor of 400 h p., which will also furnish electricity for lighting purposes.

The Pittsburg District:—

A report is current that the American Tin Plate Co. intends to add four tin mills to its plant at Monessen, Pa.

The Monessen (Pa.) Steel Co., which a few months ago began the erection of a rolling mill to roll cotton ties, hoops, bands, etc., has about completed the plant and is to put it in operation this week.

It is understood that the deal whereby the American Steel & Wire Co. acquired the property of the Shoenberger Steel Co. is a cash one, the consideration being $3,800,000, of which $1,500,000 has already been paid, the balance, secured by a first mortgage on the property, being payable later, probably July 1, when the management of the plant will be turned over finally to the American Steel & Wire Co.

Spang, Chalfant & Co., Pittsburg, have notified the employes of their mill at Etna, Pa., of a general advance in wages beginning April 3.

The Oil Well Supply Co., Pittsburg, has advanced the wages of the puddlers at its plant 25 cents, or to $4.25 a ton, at the same time advancing the day men about 10 per cent.

Capt. S. S. Brown, a well known Pittsburg coal operator, is interested in a project to build coal barges of steel instead of wood, and while the project has not yet taken definite shape, it is possible that a combination may be made with the Schultz Bridge & Iron Co., McKees Rocks, Pa., by which this concern will add the manufacture of steel barges to its business.

The puddlers of the Lockhart Iron & Steel Co., McKees Rocks, Pa., have had an advance of 25 cents a ton in the price of puddling, the day men employed at the plant being given a proportionate advance.

It is stated that an order given by Drake & Stratton, the contractors for foundation work on the blast furnace extension of Laughlin & Co., Pittsburg, for cement is the largest cement order ever placed, being for 30,000 barrels.

The Union Terminal Co., Pittsburg, is to be chartered by A. L. Schultz, of the Schultz Bridge & Iron Co.; James B. Oliver, interested in the Pressed Steel Car Co.; E. N. Gray, J. W. Patterson and W. P. Porter, for the purpose of building and operating a line of steel freight barges, to be ferried across the Ohio river just below Pittsburg. The line will connect with the Fort Wayne Railroad on the east side and the Pittsburg & Lake Erie on the west, and will also carry a great deal of material between plants located in the district. The present car works of the Pressed Steel Car Co. are on the east side of the river, and the new plant, on which erection is about to begin, will be on the west side, where the plant of the Schultz Bridge & Iron Co. is located.

Mention has been made of the seamless tube plant which is to be erected by H. G. Wasson, of the Park Building, Pittsburg, and his associates, who are largely in the oil business, a number being connected with the Standard interests and others being independent producers. The application for a charter will be filed the latter part of this week. The contract for the foundations was let Tuesday of this week. Two steel buildings, which are almost new, have been purchased from the Duquesne Tube Works plant, and will be put up at once, with additional buildings. Twenty drawbenches will be gotten at work at the earliest time, to be followed at once by 20 more. It is expected to have the plant running by July 1. The P., Ft. W. & C. Railroad has begun work on the switch to run into the property, which is at Beaver Falls, Pa. The plant will manufacture the tubing complete from the ingot, the first operation being the piercing. Steel of domestic manufacture will be largely used.

The Pittsburg Steel Casting Co., mentioned last week, is a limited partnership, formed about a month ago to erect a steel casting plant in Pittsburg near the bridge across the Allegheny river to Sharpsburg. A 15-ton acid open-hearth furnace is to be built for which the contract has been let. Charles D. Marshall, secretary of the Shiffler Bridge Co., is chairman; C. C. Smith, of the Reliance Steel Casting Co., is secretary, and Uriah Tinker, secretary of Samuel Trethewey & Co., Ltd., is treasurer. Howard Fisher, who has been connected with the McConway & Torley Co., will be superintendent. Until an office building can be erected on the ground, the company has an office in the Fisk telephone building, Fisk and Butler sts., Pittsburg.

James McKay & Co., chain manufacturers, whose plant is located at 25th st. and Liberty av., Pittsburg, have decided to remove to McKees Rocks, Pa., in order to secure additional room, which is an absolute necessity. The chain works will be about doubled when the removal is completed, and later on several new but closely related branches of manufacture will be taken up.

Ground will be broken at Tarentum, Pa., about April 10 for the plant of the recently formed J. H. Baker Mfg. Co., Ferguson Bldg., Pittsburg, to manufacture a variety of forgings.

A 34-inch slabbing mill and shear is being built by McGill & Co., Pittsburg, for the Nicopol-Mariopol Mining & Metallurgical Co., Mariopol, Russia. The latter concern about two years ago built a steel plant, most of the equipment coming from Pittsburg manufacturers.

An advance of about 10 per cent has been made in the wages of the employes in the Bessemer steel department of the National Tube Works Co., McKeesport, Pa. The company lately advanced the wages of the employes in the tube

ONE OF THE WAYS

To improve the quality of your boiler feed supply, in other words, to keep scale out of your boilers, is to save and use the exhaust steam condensed in your heating system, as well as that condensed in your closed heater; but it will not be safe for you to use this condensation, (which is nothing more or less than distilled water) unless you have first freed it from the cylinder oil with which it is contaminated.

The Cochrane Oil Separators will purify exhaust steam from oil—right service and right prices have resulted in our placing more than 1,500 of these appliances, which are giving the results their purchasers were after.

We place at your command the knowledge and experience which we have gained in this line.

HARRISON SAFETY BOILER WORKS,
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Philadelphia, Pa.

Mfrs. of the Cochrane Heaters.

works proper, and has also just advanced the wages of the employes at the Republic Iron Works, on the South Side, Pittsburg, the sheet mill department of the company.

Announcement has been made by Jones & Laughlins, Ltd., beginning April 15th, employes will receive an advance of 10 per cent in wages. This will affect about 2,000 men who are paid by the day. The tonnage men signed a wage scale which is operative until next January.

Alex. Laughlin & Co., Pittsburg, have contracted to erect a new 100-ton furnace at the Continental Tube Works, to replace one that was torn down. The new furnace will be modern throughout. It is to be completed by June.

Spang, Chalfant & Co. have announced an advance in wages dating from April 3.

The Oil Well Supply Co. has advanced puddlers' wages to $4.25, or 25 cents above the Amalgamated scale.

G. H. Ginther, agent of the Uehling pig iron casting apparatus, has a contract from the National Steel Co. to put in a 1,000 ton plant at the Ætna-Standard furnaces at Mingo Junction, O.

A contract for two of the largest engines ever built for export has just been awarded by the Mariopol-Nicopol Mining & Metallurgical Co., of Mariopol, Russia, to Mackintosh Hemphill & Co. They will be used to drive a slabbing mill that has been designed for the Russian plant by Julian Kennedy. One of the engines now being built has two cylinders, each 46 inches in diameter, with 60-inch stroke, and weighing about 800,000 pounds. Along with it is a smaller engine with cylinder 26 inches in diameter and having a 30-inch stroke.

The Hyde Bros. & Co., Pittsburg, are putting in two 250-h. p. boilers for the Pullman Palace Car Co.'s rolling mill department, for using waste heat from heating furnaces.

Graff & Co., Pittsburg, have removed their stove making business from Sharon, Pa., to Monongahela City, Pa., and a party of Pittsburgers are looking over the Sharon property with a view of starting in the foundry business there.

The strike at the Fox plant of the Pressed Steel Car Co., Pittsburg, has been terminated by the company's granting an advance about equal to the demand made by the men.

It is interesting to note that at a number of mills in the Pittsburg district the non-union puddlers have lately had their wages advanced to $4 25 a ton, which is 25 cents a ton above the Amalgamated rate prevailing for some time on the sliding scale. It should be borne in mind, however, that in the long run the union puddlers have received higher wages, and that at present they receive benefit from several foot notes, among which is the advance for working strong iron.

The Chicago District:—

J. J. Ryan & Co., brass founders and finishers, 68-74 W. Monroe st., Chicago, report their foundry running full, part of the business consisting of a number of good-sized orders from ship builders. The activity in the ship building line at present is so pronounced that the firm is constantly receiving inquiries and orders both for new work and repairs. The facilities of the foundry are ample, however, and they are getting out all orders promptly. They use only new metal in the work—ingot copper and pig tin, securing better results in castings than where scrap is used. The machine shop, polishing and plating and babbitt metal departments of the same works are running full.

The Davis Coal & Coke Co. announced recently to its Chicago trade that it had opened an office in Old Colony Building, Chicago, so that business in that district could be taken care of with dispatch.

Messrs. Charles H. Besly & Co., 10 and 12 North Canal st., Chicago, report that they are very busy in the tap and die department at their factory, Beloit, Wis. They are making many shipments of their new Badger non-adjustable die stock, which cuts the same size every time, and full thread a tone cut. These are made each complete in the bicycle sizes as well as in the machine screw and regular bolt sizes. Recent shipments of taps and dies have been made to Rockford, Milwaukee, Rock Island, Moline, Pullman, South Chicago, Joliet, Omaha, London, Lima, and Rio de Janeiro.

The White River rolling mill at Muncie, Ind., long idle, is about to start up.

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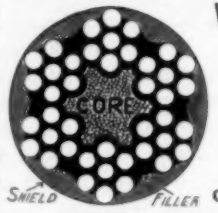

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General Industrial Notes:—

The car manufacturing plant of Pennock Bros. at Minerva. O., was sold to the American Car & Foundry Co., and has been in the possession of that company since March 1.

The National Steel Co. has advanced the wages of unskilled workmen about 10 per cent in the Warren, O., plant, formerly known as the Warren mill of the Union Iron & Steel Co. The plant produces bar iron and skelp.

The Pittsburg Wire Co.'s plant of the American Steel & Wire Co. was compelled to suspend operations for a part of last week owing to scarcity of billets.

The stockholders of the Warren Foundry & Machine Co., at Easton, Pa., have elected the following directors: James W. Long, Wm. Runkle, H. G. Runkle, John S. Riegel, W. H. Hulick, E. J. Fox, and A. D. Chidsey.

Orders for seven 2,500 h. p. transformers, involving the largest units ever manufactured, have been placed with the Westinghouse Electric & Mfg. Co. by the Niagara Falls Power Co. These transformers will be of the same type and of the same general appearance as the four 850-k. w. transformers built by the Westinghouse company for the Cataract Power & Conduit Co. and installed about a year ago.

At Youngstown the association of iron manufacturers has increased the wages of common labor in mills from $1.15 to $1.25 a day.

The Wheeling Steel & Iron Co., Wheeling, has made an increase in wages averaging about 15 per cent, the minimum increase being 10 per cent.

The blast furnace employes at the Bellaire plant of the Bellaire Steel Co. have received an advance in wages of 15 cents a day.

The Washington Coal & Coke Co., in Washington township, Fayette county, Pa., has given to Bennett & Talbot, of Greensburg, the contract for erecting 150 new coke ovens.

The Chemin de fer Paris a Orleans has placed an order here for 8 locomotives. Car orders: Wabash, 500 coal cars; Columbus, Hocking Valley & Toledo, 1,000 coal cars; New York Central, 6,000 cars; Mobile & Ohio, 100 flat cars; Wheeling & Lake Erie, 500 steel cars; Minneapolis & St.

U. BAIRD MACHINERY CO.,

423-425 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

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One 22 x 42 in. Wright Corliss Engine. Band wheel, 16 ft. x 36 in.

This engine is in first class order, and will be sold at a very reasonable price.

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Louis, 12 passenger cars; Rutland, 500 box cars; Huntingdon & B. T. M., 500 coal cars. Several hundred freight and passenger cars for sundry other roads.

The Davies Casting Machine Co., Warren, O., has closed a contract with the Penn Iron & Coal Co., Canal Dover, O., for a Davies casting machine, to be installed within the next six or eight weeks. The molds in the Davies machine are mounted on a circular revolving table.

The Wm. Cramp Ship & Engine Building Co., Philadelphia, has a force of 5,000 men at work, with prospects that they will be kept busy through the year. The company has now in hand work on the two Russian war vessels, the two American war vessels, the Mexico, a steamer for the Plant Line, and the four recently contracted for by the Oceanic Steamship Co., which are to be completed in a year. Two stocks are vacant, and preparations are going forward for the laying of two more keels.

The John B. Norris Foundry Co., of Cincinnati, has notified its employes that after March 27 wages of bench and floor molders will advance 10 per cent.

Receiver Geo. A. True, of the Frontier Iron Works, Detroit, will sell all the assets of the company at public sale on April 18. There is a main building of four stories an erecting shop, iron and brass foundries, blacksmith shop, etc. The plant is one block from Detroit River.

At Lebanon, Pa., Sheridan furnace No. 1 went into operation again March 22.

An erecting gang from the Pencoyd Iron Works, Pencoyd, Pa., will leave for Africa to build a bridge across the Atbara river, in the Soudan, near Khartoum.

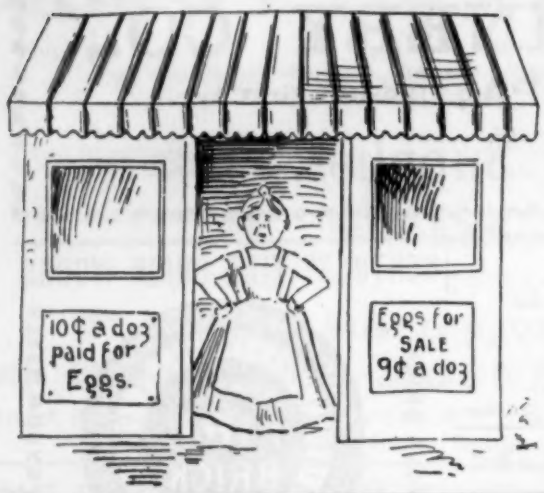
The New Castle Shovel Co., New Castle, Pa., which erected a shovel factory this winter, is doubling its capacity.

The Covington Furnace, Covington, Va., of the Low Moor (Va.) Iron Co., blew in last week. The Low Moor Iron Co. makes forge and foundry irons exclusively.

The Iron Gate (Va.) Furnace of the Allegheny Iron Co. has not yet been blown in, though reported in some of the trade papers as having resumed recently.

The Syracuse Tube Co., Syracuse, N. Y., has advanced wages 10 per cent.

The Wrong Kind of "Figgering."



An old market woman used to buy her eggs for 10 cents a dozen and sell them for 9 cents a dozen.

"But how on earth can you make anything that way?" she was asked.

"Sure, by doin' a ver-r-ry large business."

I am afraid some men are running their foundries on a similar losing plan.

They lose more money buying supplies than they make as profit on their castings.

As it is, the margin of profit in the foundry business is small enough.

It is hard enough and takes enough wear and tear on the brain and nerve to make it pay.

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I am offering you good money saved in buying for and equipping your foundry. There are good, logical, convincing reasons why I can sell you cheaper than anyone else. All I want is a chance to come into competition.

I sell everything for the foundry. Just now **Molding Sand** claims attention, for this is the time of year when it is in the right condition to ship. Another thing of importance is my stock of **Plumbago** and **Talc.** It is worthy of attention. It's the pure quill. In these days of adulteration, misrepresentation, etc., a good, genuine article is an article of economy. If you don't believe this, let me send you samples.

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The Spanish War in The Century Magazine.

THE CENTURY is making a wonderful success of its great series of articles on the Spanish War by the men who fought it. Captain Sigsbee has told the story of the *Maine;* Lieutenant Hobson has given his graphic narrative of the sinking of the *Merrimac;* General Shafter has described the Santiago campaign.

In March General Greene begins his description of the Manila campaign; and in April is

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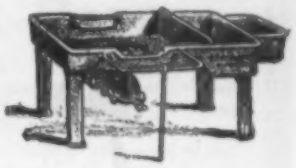
Price $3.

Sturtevant Forges.



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We Design and Furnish Complete
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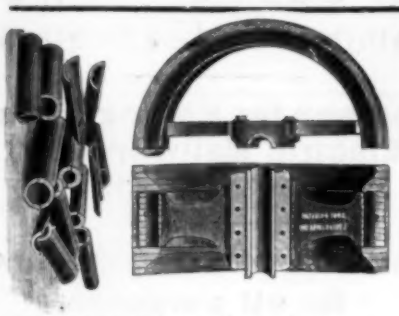

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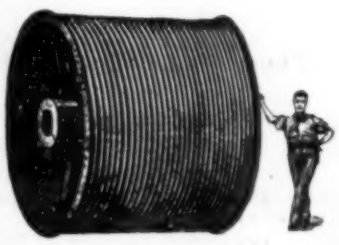

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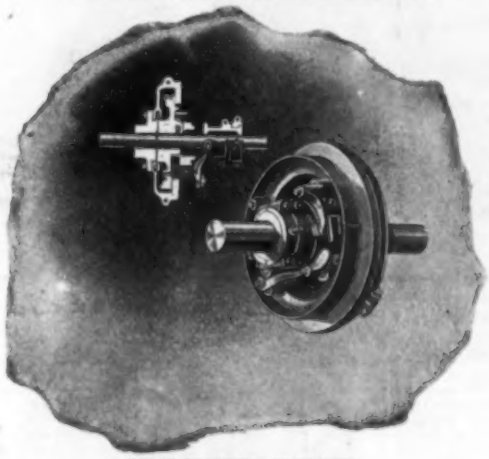

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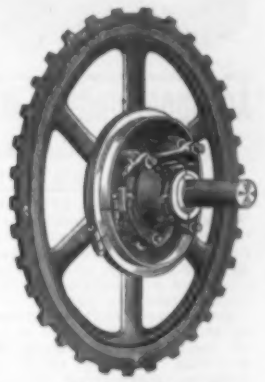

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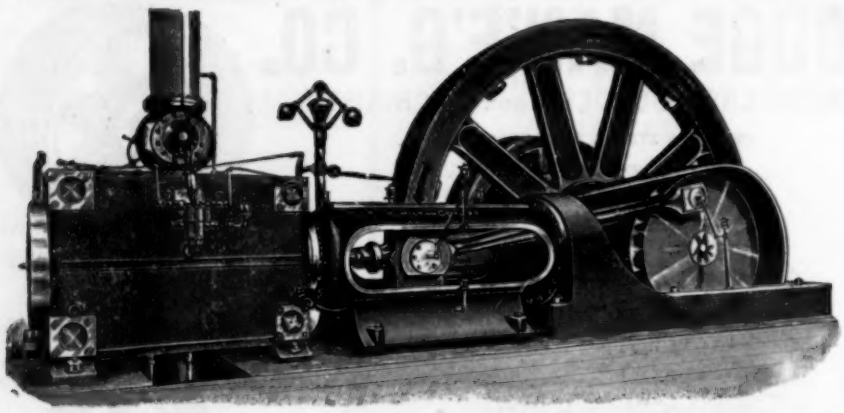

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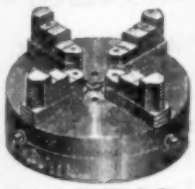

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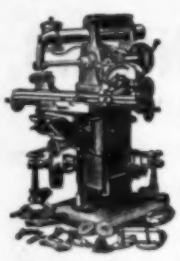

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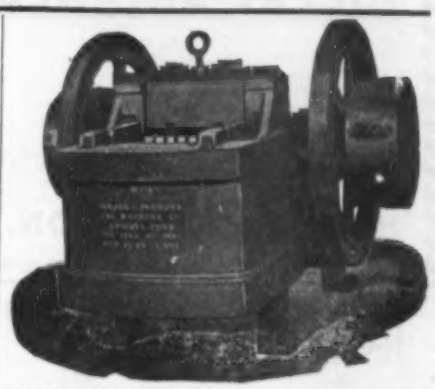

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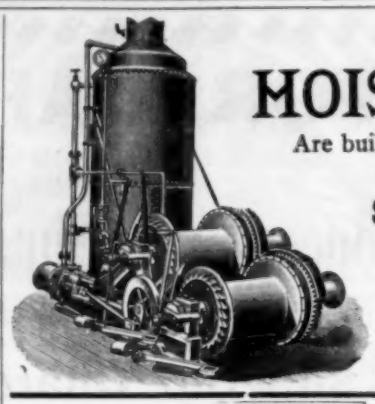

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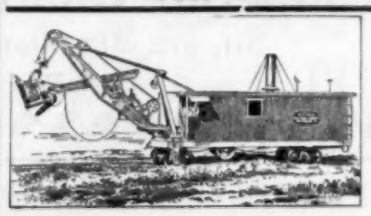

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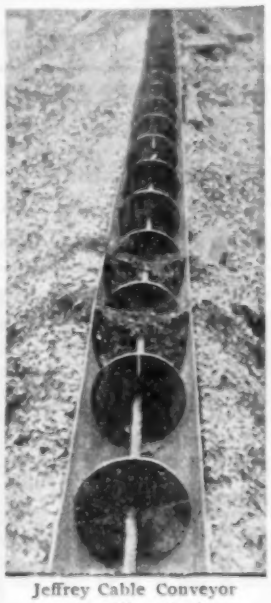

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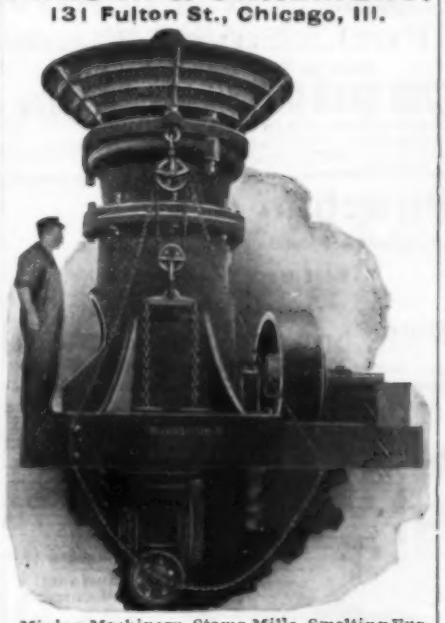

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The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

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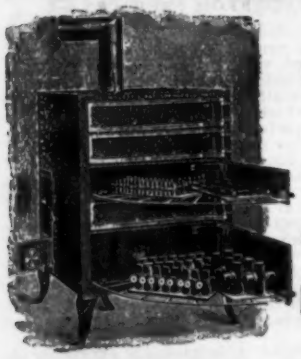

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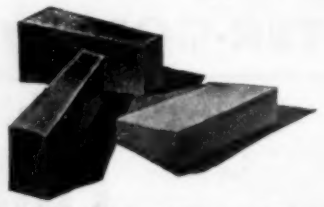

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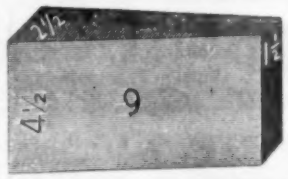

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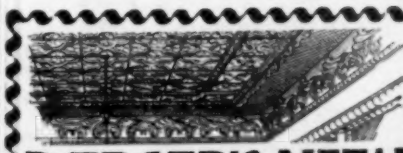

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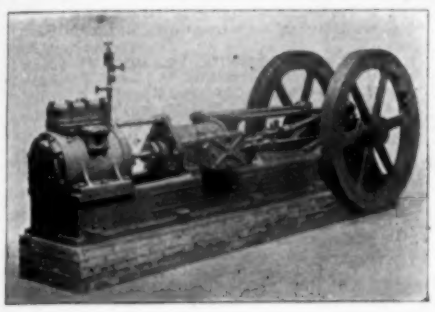

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Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
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U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Chicago Die and Machine Works, Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
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Bickford Drill & Tool Co., Cincinnati, O.

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C. H. Besly & Co., Chicago, Ill.
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Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Machinists' Vises—
Massey Vise Co., Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
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Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

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Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

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Perfect Lubricating Metal Co., Cincinnati, O.

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Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.

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Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.

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Tabor Mfg. Co., Elizabeth, N. J.

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Fred M. Prescott Steam Pump Co., Milwaukee, Wis.

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F. B. Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
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Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
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American Tin Plate Company, Chicago, Ill.

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La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

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Dodge Mfg. Co., Mishawaka, Ind.
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S. W. Goodyear, Waterbury, Conn.
A. H. Nilson Machine Co., Bridgeport, Conn.

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Shenango Valley Steel Co., New Castle, Pa.

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Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Ætna-Standard Iron & Steel Co	28
Ætna Fire Brick Co	32
Aitchison, Rob't, Perforated Metal Co	31
Allis & Co., Edward P	39
†American Gas Furnace Co	—
*American Pneumatic Tool Co	—
American Tin Plate Company	41
Apollo Iron & Steel Co	1
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	27
Aultman Co	2
Bacon, Earle C	29
Baird Machinery Co	23
Baush & Harris Machine Tool Co	44
Becker, August	1
*Berger Mfg. Co	32
*Bertsch & Co	—
Besly & Co., Chas. H	44
Bethlehem Iron Co	43
*Bickford Drill & Tool Co	—
Bickford, H	44
Blakeslee Mfg. Co	1
Bourne-Fuller Co	1-2
Bræburn Steel Co	37
Brainard Milling Machine Co	27
Brass Founders' Supply Co	32
Breitung, Edward N	29
Bristol Co., The	1
Britton & Co., J. Blodgett	2
*Brown, Edward	29
Brown Hoisting and Conveying Machine Co	30
Bucyrus Co	30
Cahall Sales Department	1
Central Electrotype & Engraving Co	42
*Champion Rivet Co	29
Chicago Fire Clay Product Co	32
Chicago & Northwestern Ry	25
*Chicago Die & Machine Co	37
Chicago Press Clipping Bureau	30
*Chicago Rawhide Mfg. Co	—
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	32
Cleveland City Forge & Iron Co	1
†Cleveland Facing Mill Co	33
Cleveland Rolling Mill Co	28
Cleveland Tool & Supply Co	27
Clinton Iron & Steel Co	28
*C. M. & St. P. Ry	24
Cole, J. Wendell	44
Columbia Fire Clay Co	32
Covert Mfg. Co	30
Cramp & Sons, Wm	40
Crane & Co., B. P	43
Crescent Steel Co	37
Crowell Benedict	1
Delano, E. A	28
Detroit Sprocket Chain Co	22
Dickman & MacKenzie	2
Dixon, Jos., Crucible Co	40
*Dodge Mfg. Co	25
Dover Fire Brick Co	32
Eclipse Electrotype & Engraving Co	42
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	23
Fitzsimons & Co	37
*Fix Sons	—
Fleharty, J. H. & Co	2
Forster, Waterbury & Co	1
Fox Machine Co	—
Fraser & Chalmers	31
Frick Coke Co., H. C	1
Gandy Belting Co	44
Garden City Sand Co	32
Gerlach, Peter & Co	29
Gobeille Pattern Co	37
Goodyear, S. W	37
Greenwald Co., I. & E	26
Hall Steam Pump Co	33
Hanna & Co., M. A	28
Harrington & King Perforating Co	1
Harrington Son & Co., Edwin	44
Harrison Safety Boiler Works	21
Hartford Steam Boiler Insp. & Ins. Co	29
Heyl & Patterson	30
†Hickman & Williams	28
Holmes, Strachan & Co	32
Hooven, Owens & Rentschler Co	26
Hunt Robt. W., & Co	2
Illinois Central R. R	24
Ingersoll-Sargent Drill Co	2
Iron Clad Paint Co	40
Ironsides Co	22
Jeffrey Mfg. Co	31
Jenkins Bros	40
Jones & Co., John T	2
Jones Foundry & Machine Co., W. A	1
Jones & Laughlins, Ltd	41
Kentucky Fire Brick Works	25
Konigslow & Bro., R	27
La Belle Steel Co	37
Lake Superior Consolidated Iron Mines	28
Lane & Bodley	39
Laughlin & Co., Alex	31
Lidgerwood Mfg Co	30
Link-Belt Machinery Co	30
Lorain Steel Co	41
Lozier & Co., H. A	43
Lusch, H. B	2
Main Belting Co	38
Marion Steam Shovel Co	44
Massey Vise Co	1
McDowell, Hanson	23
McKeefrey & Co	28
Meehan Boiler & Construction Co	44
Millers Falls Co	44
Millett Core Oven Co	32
†Modern Machinery	—
Morris & Bailey Steel Co	37
*National Engraving Co	27
National Tube Works Co	43
†Newport Sand Bank Co	33
Nilson, A. H., Machine Co	27
Northampton Emery Wheel Co	38
Norwalk Foundry & Machine Co	33
Nuttall Co. The R. D	26
Oak Hill Fire Brick & Coal Co	23
Obermayer, S. & Co	32
Oglebay, Norton & Co	28
†Ohio Sand Co	33
Ohio Steel Co	28
Otis Steel Co	22
†Parkhurst & Wilkinson Co	—
Perfect Lubricating Metal Co	44
Phœnix Horse Shoe Co	43
Playford Stoker Co	40
Pollock, The Wm. B. Co	2
Prescott Steam Pump Co	39
Q & C Co	22
Rand Drill Co	2
Reading Crane & Hoist Works	30
Riter-Conley Mfg. Co	31
Riverside Foundry Co	22
Rockford Bolt Works	2
Rockwell & Co., W. S	1—
Ryan, J. J. & Co	26
Salisbury Carbonate Iron Co	28
Sanderson Bros. Steel Co	37
Seaman, Sleeth Co	42
Sennett Co., Geo. B	39
Scioto Star Fire Brick Works	32
‖Sharon Fire Brick Works	1
Shenango Valley Steel Co	23
Shiffler Bridge Co	31
Shuster, The F. B., Co	27
Skinner Chuck Co	27
Spearman Iron Co	44
Standard Paint Co	23
Stevens, F. B	44-24
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Sturtevant Co., B. F	1-25
*Superior Charcoal Iron Co	29
Swarts Metal Refining Co	1
Tabor Mfg Co	32
Textor, O	2
Tod, Wm. & Co	39
Totten & Hogg Iron and Steel Foundry Co	42
Union Mining Co	32
Union Boiler Tube Cleaner Co	1
United States Hotel Co	38
Upson Nut Co	1
Van Dorn & Dutton Co	29
Vitrified Wheel Co	36
Vulcan Mfg. Co	30
Washington Coal and Coke Co	33
Webster, Camp & Lane Machine Co	23
Webster Fire Brick Co	1
White, Byron H	37
Wyman & Gordon	43

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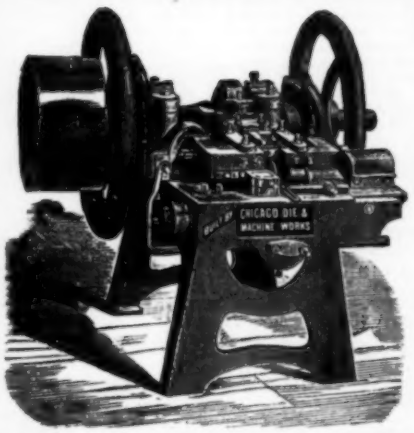

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Gray Forge, neutral	14 40
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No. 2 American Scotch	15 40@15 65
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White and Mottled	13 50
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Cold Blast Charcoal	22 00@26 00
Bessemer	15 00@15 25
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Local Coke Foundry No. 2	14 50@15 00
Local Coke Foundry No. 3	14 00@14 50
Local Scotch Foundry No. 1	15 00@15 50
Local Scotch Foundry No. 2	14 50@15 00
Local Scotch Foundry No. 3	14 00@14 50
Southern Coke No. 1	15 50@16 00
Southern Coke No. 2	15 00@15 50
Southern Coke No. 3	14 75@15 00
Southern No. 1 Soft	15 50@16 00
Southern No. 2 Soft	15 00@15 50
Southern Silveries	15 00@16 00
Jackson Co. Silveries	15 00@15 00
Ohio Silveries No. 1	@
Ohio Strong Softeners	15 00@16 00
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Coke Bessemer	15 00@15 50
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Southern Coke No. 2 and No. 1 Soft	14 25@14 75
Hanging Rock Charcoal No. 1, Fdy	17 00@18 00
Tennessee Charcoal No 1	15 00@16 00
Jackson County Silvery No 1	16 00@16 25
Southern Coke, Gray Forge	12 75@13 00
" " Mottled	12 75@13 00
Standard Georgia Car Wheel	15 50@16 00
Lake Superior " "	15 00@16 00
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$14 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 75
Ohio Strong Softener No. 1	14 00
Ohio Strong Softener No. 2	13 50
Jackson Co. Silvery No. 1	15 60
Southern Soft No. 1	15 25
Southern Soft No. 2	14 75
Lake Superior Charcoal	14 00@14 50
Coke, Malleable	14 10
ST. LOUIS:	
Southern Coke No 1	$14 75
Southern Coke No. 2	14 25
Southern Coke No. 3	13 75
Southern Coke No. 4	13 55
Southern Gray Forge	13 30
Tennessee Charcoal No 1	13 75
Jackson County 2 per cent Silicon	16 25
Lake Superior Coke No. 1	15 00@16 00
Southern Car Wheel	15 25@16 25
Genuine Connellsville Coke	4 15
West Virginia Coke	4 10

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons
Old iron rails	$18 00
Old steel rails (6 ft. and over)	14 00
Old steel rails (6 ft. and under)	14 00
Old car wheels	16 00
	Net Tons
No. 1 R. R. wrought scrap	$16 50
Mill scrap	11 50
No. 1 Machine cast scrap	12 50
Iron axles	19 00
Axle turnings	11 00
Wrought turnings (free from cast)	10 00
Cast borings	7 50
Uncut wrought iron boilers	7 00
Steel boiler plates	11 00
Grate bars	8 00
Pipes and flues (clean)	10 00
Tank iron	12 00
Hoop and band iron	9 00
Sheet iron	8 00
Wrought drillings	10 00
Malleable iron	10 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.50c
Angles	1.50c
Tees	1.50c
Universal Plates	1.80@1.90c
Sheared Plates	2.00c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅜	1.50 Base.
2 to 2⅜	.20 extra.
3 to 3⅜	.50 "
3½ to 4	.80 "
4¼ to 4½	1.00 "
4⅝ to 5	1.50 "
5¼ to 6	1.60 "
5¼ to 6½	2.00 "

VITRIFIED EMERY AND CORUNDUM WHEELS. . .

FOR

Foundry and Machine Shop Work.

CAN BE RUN WET OR DRY.

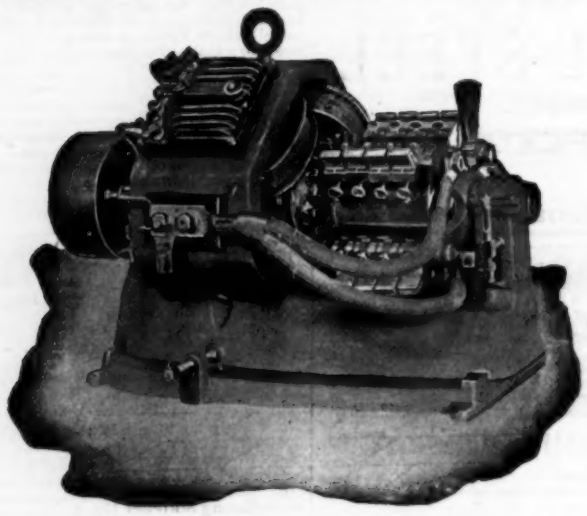
SOLD BY
Weed & Co., Buffalo, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Machinist Supply Co., Chicago, Ill.
Sligo Iron Store Co., St. Louis, Mo.

VITRIFIED EMERY WHEEL CO.,
Westfield, Mass.

Eddy Dynamo Electro-Plating Machines

FOR

BICYCLE PLATING PLANTS.



NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill.

EXCLUSIVE WESTERN SELLING AGENTS.

Weddell House.

Cleveland, Ohio.

THE U.S. HOTEL CO.

C.A. SWAN & W.L. BATES
MANAGERS

50 ROOMS AT $2.00

50 ROOMS AT 2.50

75 ROOMS AT 3 TO 4.00

All Meals 50¢ Each

LEVIATHAN

Belting

Is the strongest, runs the most evenly, and best adapted for Cotton, Woolen, Saw and Planing Mills, Brick and Tile Works and

Heavy Driving Generally.

MAIN BELTING CO.

1219-1235 Carpenter Street, PHILADELPHIA.

120 Pearl Street, BOSTON.

55 & 57 Market St., CHICAGO.

Metallurgy of Cast Iron, Price $3.00.

6⅝ to 7¼	2.50 extra
¼ to ⅜	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
¾ to 13 2	.50 "
5-16 to 1 32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base
4¼ o 6 x ⅜ to 1	.10 extra
6¼ o 8 x ⅜ to 1	.60 "
8¼ o 10 x ⅜ to 1	.80 "
1⅜ o 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅜ to 2	.50 "
4¼ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅜ to 3	.60 "
4¼ to 6 x 2⅜ to 3	.80 "
6¼ to 8 x 2⅜ to 3	1.00 "
1¼ to 1⅜ x ¼ to 1	.10 "
1 to 1 1-16 x ¼ to ⅜	.20 "
¼ to 15-16 x ¼ to ¼	.40 "
⅜ to 11-16 x ¼ to ⅜	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅜ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Bended Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅜ to 1½	.40 extra
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅜	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

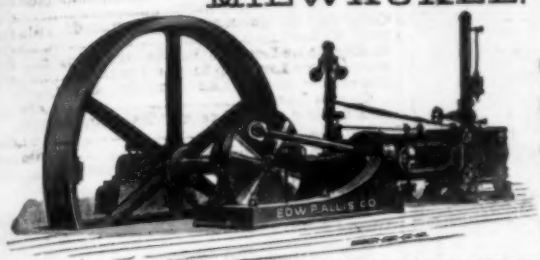
Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1¼ to 6,	" 10, 11, 12 or 5/16"	.05 per 100 lbs.
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¾,	" 10, 11, 12 or 5/16"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras.
7-16 to 2,	" 17, 18, and 19	.05 per 100 lb
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1¾,	" 22	.25 "
½ to 1¾,	" 13, 14 and 15	.05 "
½ to 1¾,	" 16, 17 and 18	.10 "

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

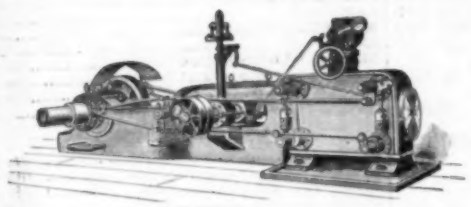
Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO. PITTSBURG.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

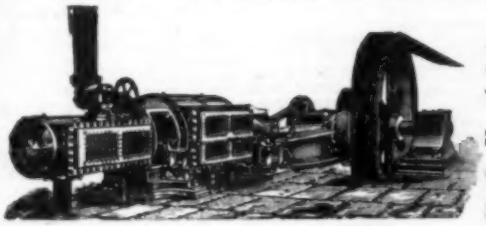
Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Park Building, Pittsburg.

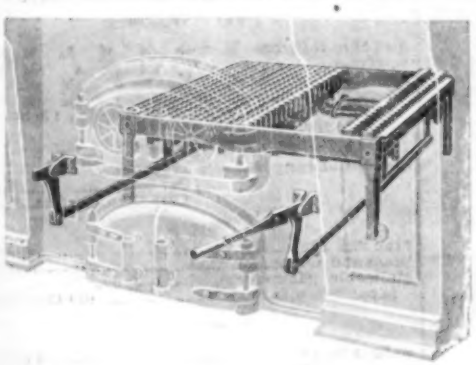
SEWARD S. BABBITT.

Who builds the best Mine Pump?

PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.



The Geo. B. Sennett Co.,

YOUNGSTOWN, OHIO.

Manufacturers of the

SENNETT ROCKING GRATE.

ECONOMY OF FUEL.
ECONOMY OF TIME.

Prevents large clinkers. Convenient and Substantial. Apply for circulars.

We make also SENNETT ENGINE, 20 to 40 H. P.
SENNETT COMPRESSION COUPLING
and CASTINGS to 5 tons each.

1⅛ to 1⅜,	19 and 20	per 100 lbs.
1⅛ to 1⅜,	21	.20 "
1⅛ to 1⅜,	22	.30 "
15-16 and 1,	13, 14 and 15	"
15-16 and 1,	16, 17 and 18	.15 "
15-16 and 1,	19 and 20	.20 "
15-16 and 1,	21	.25 "
15-16 and 1,	22	.35 "
⅞,	Nos. 13, 14 and 15	.20 "
⅞,	" 16, 17 and 18	.25 "
⅞,	" 19 and 20	.30 "
⅞,	" 21	.35 "
⅞,	" 22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
½,	" 13, 14 and 15	.55 "
½,	" 16, 17 and 18	.60 "
½,	" 19 and 20	.70 "
½,	" 21	.80 "
½,	" 22	.90 "
½,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
⅜,	" 13, 14 and 15	1.00 "
⅜,	" 16, 17 and 18	1.10 "
⅜,	" 19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	13c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅝ and 2¾ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
¼ to 9-32 and 6¼ to 7 in	.11
1 in.	.13

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ⅝ inches diameter	3 00
Bridge ⅛, ⅜, 11-16 and ⅝ inch diam.	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent.				.78
Butt "	"	"		.72
Lap "	galv.	"	"	.70
Butt "	"	"	"	.67
Boiler tubes 2¼" and smaller				.72½
Boiler tubes 2½" and larger				.72
Casting screw and socket joint				dis. 50
Casing inserted joint				dis. 45

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

Magnolia Anti Friction Metal, 25 cts. per lb., f. o. b New York or Chicago.
No Name Metal, 15 cts per lb., f. o. b. New York or Chicago.
Mystic Metal, 10 cts. per lb, f. o. b. New York or Chicago.

Anvils.

American	₩ lb 09½c
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis
	Bullock's	dis 50 & 1
Moulders'		dis 40&10&10
Rand		dis 40&10&50

The Playford Mechanical Stoker

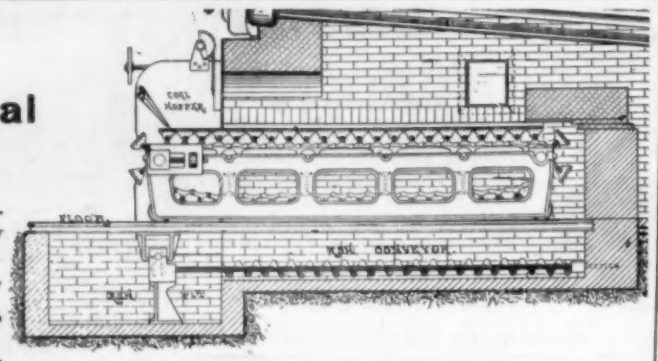
Guaranteed to Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.

404 Telephone Bldg.,

CLEVELAND, OHIO.



IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND. OHIO.

made from Patterns

ORDER DIRECT FROM THE

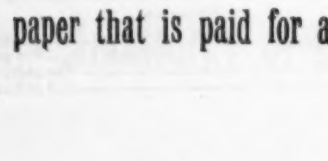
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.



COMPARE WEIGHTS

WHEN YOU ARE TOLD THAT JENKINS '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.

Average weight, 1/8" "Jenkins '96." 11 lbs. to the square yard.
" " 1/8" Red Packing, 14 " " " " "

At 50c. per pound "JENKINS '96" is not only very much cheaper, but the best joint packing manufactured.

JENKINS BROS., New York, Boston, Philadelphia, Chicago.

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES,

Castings and Propeller Wheels

MADE FROM

PARSONS MANGANESE BRONZE

CANNOT BE EXCELLED. WRITE FOR PARTICULARS.

SOLE MAKERS.

THE WILLIAM CRAMP & SONS

Ship and Engine Building Company,

PHILADELPHIA, PA.

A paper that is paid for and read—THE IRON TRADE REVIEW.

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 35
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shults Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shults Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 60
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@1
Pratt & Whitney	dis 10@1
Standard	dis 10@1
Morse	dis 10 to 1
Brown & Sharpe, Milling Cutters	dis 1
" " Gear Cutters	dis 1

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper&Straight Shank to 1¼"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F F. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6¼c	c
10 lb cans less than 10	10 c	10 c	¼c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8⅛	6	5⅜	5⅛	
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.

Car lots	$1.30
Less than car lots	$1.4

Oilers.

Zinc and Tin	dis 6
Brass and Copper	dis 30
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&15

Picks.

Railroads, 5 to 6 lbs	dis $12 60
" 6 to 7 lbs	dis $13 60

JONES & LAUGHLINS, Limited,

PITTSBURG, PA.

Branch House, CHICAGO, ILL. Branch Office, 220 Broadway, NEW YORK.

MANUFACTURERS OF

ACID OPEN HEARTH,
BASIC OPEN HEARTH and
BESSEMER STEEL INGOTS,
BLOOMS AND BILLETS,
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Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta,...	†2:10 P M	†11:00 A M
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15	13	11		12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6 58
5:15	3:12	7:23	Lester.....	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland ...	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19
6:52	3:35	8:30	Medina.....	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport...	.....	6:05	1:40
.....	8:25	.....	Bellaire.....	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

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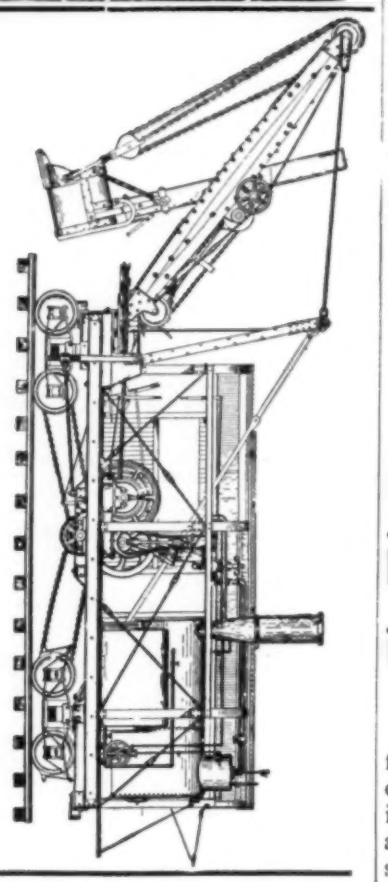

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